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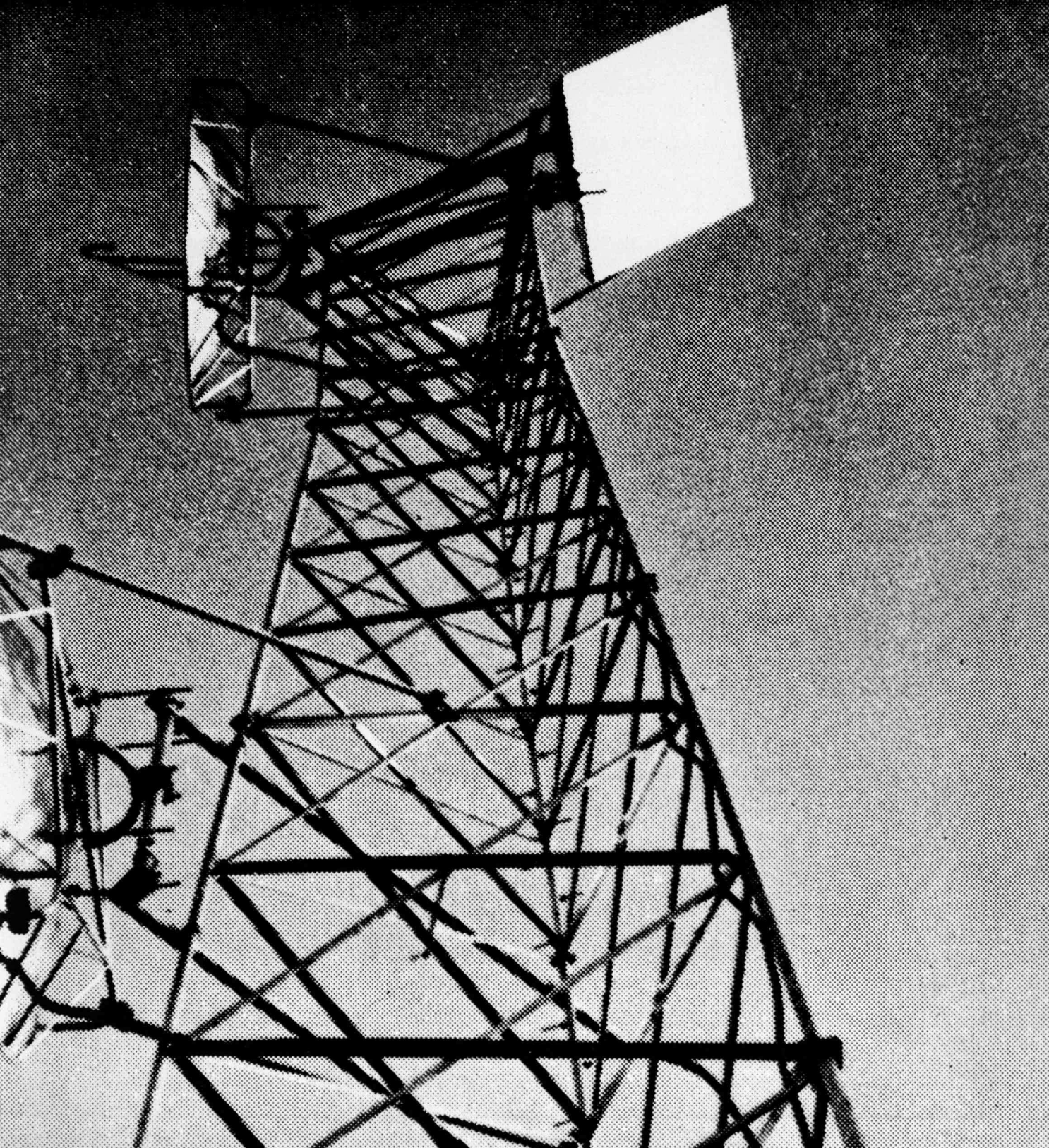
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Philip M. Walker and Stuart L. Mathison:
Communications Carriers: Evolution or Revolution?

Gordon S. Brown: The Challenge of Relevance
Edgar H. Schein: Educating the Role Innovator
Warren G. Bennis: The Sciences of Society



Technology Review



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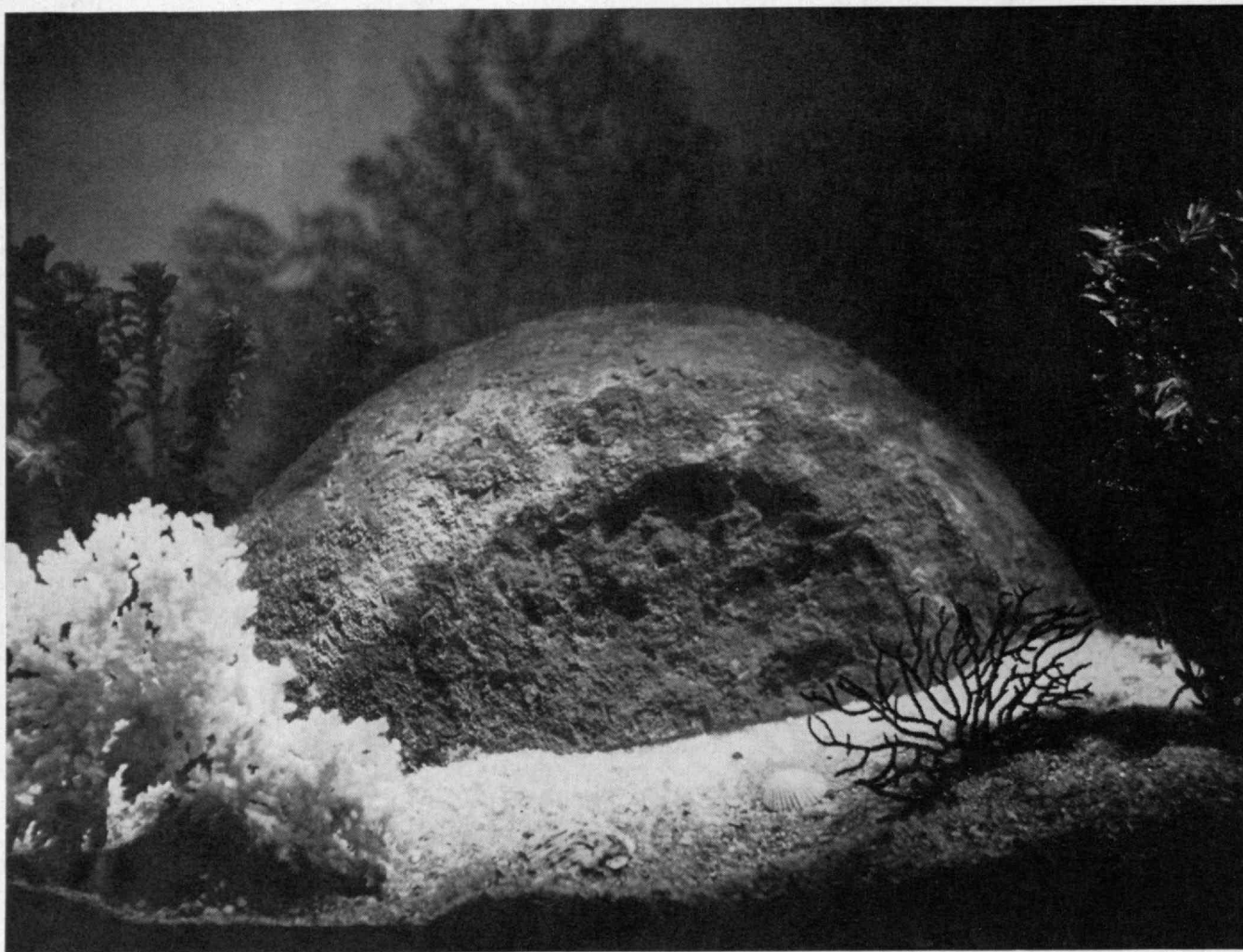
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The First Line

Two remarkable summer activities have shed modest new light on the dimly seen issues which technology brings man: Can our accelerating rate of using energy and resources be sustained without irreparable changes in the very conditions which make those things available to us? And how is this question affected by other world issues which should be—but may not be—under man's control?

The summer study of critical global environmental problems (see page 58), conducted by more than 50 experts over a month-long period, has issued a series of recommendations concerning our present state of ignorance, which the project served largely to illuminate.

1. Gain more knowledge about our future need of fossil fuels and how carbon dioxide in fact enters and leaves the atmosphere and oceans.
2. Study the optical and mechanical behavior of fine particles, and continue monitoring them in the atmosphere.
3. Resolve uncertainties about their contamination of the stratosphere "before large-scale operation of supersonic transports begins." (The traffic of commercial supersonic aircraft projected for late in the current century, says the report of the Study of Critical Environmental Problems (S.C.E.P.), "can have a clearly measurable effect on a large region of the world and quite possibly on a global scale.")
4. Make "a drastic reduction in the use of DDT as soon as possible."
5. Make a similar "drastic curtailment" of pesticidal and biocidal uses of mercury and control its emission as waste.
6. Begin "much more extensive research" on the effects of oil in the ocean.
7. Reduce the flow of nutrients into the ecosystem by reclaiming wastes.
8. Develop "an independent, intensive, multidisciplinary study" of the trade-offs in national energy policy between fossil fuel and nuclear sources, focussing especially on "safe management of radioactive by-products of nuclear energy."

S.C.E.P. found no grounds for global concern in three areas of its study: thermal pollution, atmospheric oxygen supplies, and the effects of conventional jet aircraft. It issued no warnings of crisis and catastrophe, unless important research is

postponed. But it did not underestimate the problems of pollution compounded, as the S.C.E.P. report says, "because contributions to global pollution come from activities in countries all over the world. . . . If others pollute our common resources of air and oceans, the perils remain."

The very act of writing about such issues seems to oversimplify them. We are indeed surrounded by a web of conflicting instincts: preserve ourselves and our environment—but in doing so maintain our present state of relative wisdom and comfort. Help others, including especially the Third World, to achieve those things in which we take pride—but in so doing somehow avoid depletion and pollution.

The world view which these questions raises is still beyond our grasp—or nearly so. Having two years ago undertaken to model the complex interrelationships in the modern city—new industry, old industry, good housing, poor housing, employment and unemployment, taxes, land use, and more (see Technology Review for April, 1969, pp. 21 ff.)—Jay W. Forrester, Professor of Management at M.I.T., began this summer to outline the far more complex model which may ultimately describe the worldwide interrelationships between production, pollution, population, energy, and life style.

Whether these two projects, representing the best tradition of science—marshalling facts and listing unknowns—can help us cope with the ultimate issue remains for the future to know. That future is drawing very near.—J.M.

Clyde C. Hall, 1902-1970

The Editors regret to report the sudden death on August 5 of Clyde C. Hall, a frequent contributor to *Technology Review* on affairs affecting science in the nation's capital. Mr. Hall served as Acting Managing Editor of the *Review* for a brief period in 1968, a few years after his retirement as Public Information Officer of the National Science Foundation; his newspaper career had begun with the *Boston Herald* following graduation from Dartmouth College in 1926. His helpful contributions and his wise counsel—always cheerfully given to the *Review*—will be sorely missed.



Technology Review

Articles

Can We Fulfill the Challenge of Relevance?

Gordon S. Brown

The role of the engineer—and of the modern university—is the deliberate and organized forcing of technological, political, social, and economic change

The Role Innovator and His Education

Edgar H. Schein

Professionals may be custodians, content innovators, or role innovators; they have their choice, but the burden of progress is on those who accept new responsibilities and practice in new ways

The Failure and Promise of the Social Sciences

Warren G. Bennis

The sciences—and the social sciences—have somehow failed to bring understanding of their potential to those who might most benefit from it; how can the right ideas be put in the right hands?

Communications Carriers: Evolution or Revolution?

Philip M. Walker and Stuart L. Mathison

A case history of how new technology yields new problems—as well as opportunities—for government and society is provided in the control and expansion of microwave communications channels

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The computer—and thinking about teaching about thinking

Toward a new order in the disordered house of science



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In the minds of many, modern technology has created a monster.

The computer.

We've all heard the stories about people making, say, a \$30 purchase. And then being billed for \$3,000 by the computer.

Nonsense.

The danger is not that the computer makes mistakes, but that human errors remain uncorrected while the machine rolls on, compounding them.

Computers are literal minded. They must be correctly instructed to help us in the solution of problems. They do exactly what they are told. Not what they ought to have been told.

The computer is man's assistant. Not his replacement.

The unaided human mind needs help to cope successfully with the complexity of our society.

Intellectual aids, such as computers, will not only increase the skill of our minds, but leave more time for human creativity by freeing man of burdensome routine tasks.

Do we really believe that our achievements in space could have been accomplished without computer assistance?

Do we really believe that we can function efficiently in our complex modern environment without computer assistance?

The answer, of course, is obvious.

In truth, the invention of the computer can be compared with the invention of the printing press.

Engineers engaged in the development of computer systems are convinced that over the next decade it is possible to develop networks of interconnected computer systems capable of offering a wide variety of services to the public.

By necessity, one-way mass communications — radio, television—deal with a common denominator of entertainment. This situation can be changed by developing computer-based systems that offer each individual an almost unlimited range of entertainment and information. Each individual will select what he wants, and to how great a depth he wants to delve into the areas in which he is interested.

At his choice of time.

Apply this principle to education.

What it amounts to is individualized instruction. To meet simultaneously the needs of many students.

From a practical standpoint, limits to excellence in education are almost purely economic.

The computer provides a solution by performing high quality instruction for large numbers of students, economically.

Our goal is to make it possible for a teacher to provide individual guidance to many students, instead of few.

Yet, computer-assisted instruction is not a concept which has been enthusiastically embraced by all. There are many who feel that the computer will replace teachers.

Not so.

This interpretation implies mechanizing, rather than personalizing, education.

Everywhere in our lives is the effect and promise of the computer.

Its ability to predict demand makes it possible to apply the economies of mass production to a wide variety of customized products.

It will allow for the use of a computer terminal device for greater efficiency in home shopping and much wider diversity in home entertainment.

It can be a safeguard against the boom and bust cycle of our economy.

In short, the computer means accuracy, efficiency, progress.

The computer affords us the way to store knowledge in a directly usable form—in a way that permits people to apply it without having to master it in detail.

And without the concomitant human delays.

The computer is indicative of our present-day technology—a technology which has advanced to such an extent that man now is capable, literally, of changing his world.

We must insure that this technological potential is applied for the benefit of all mankind.

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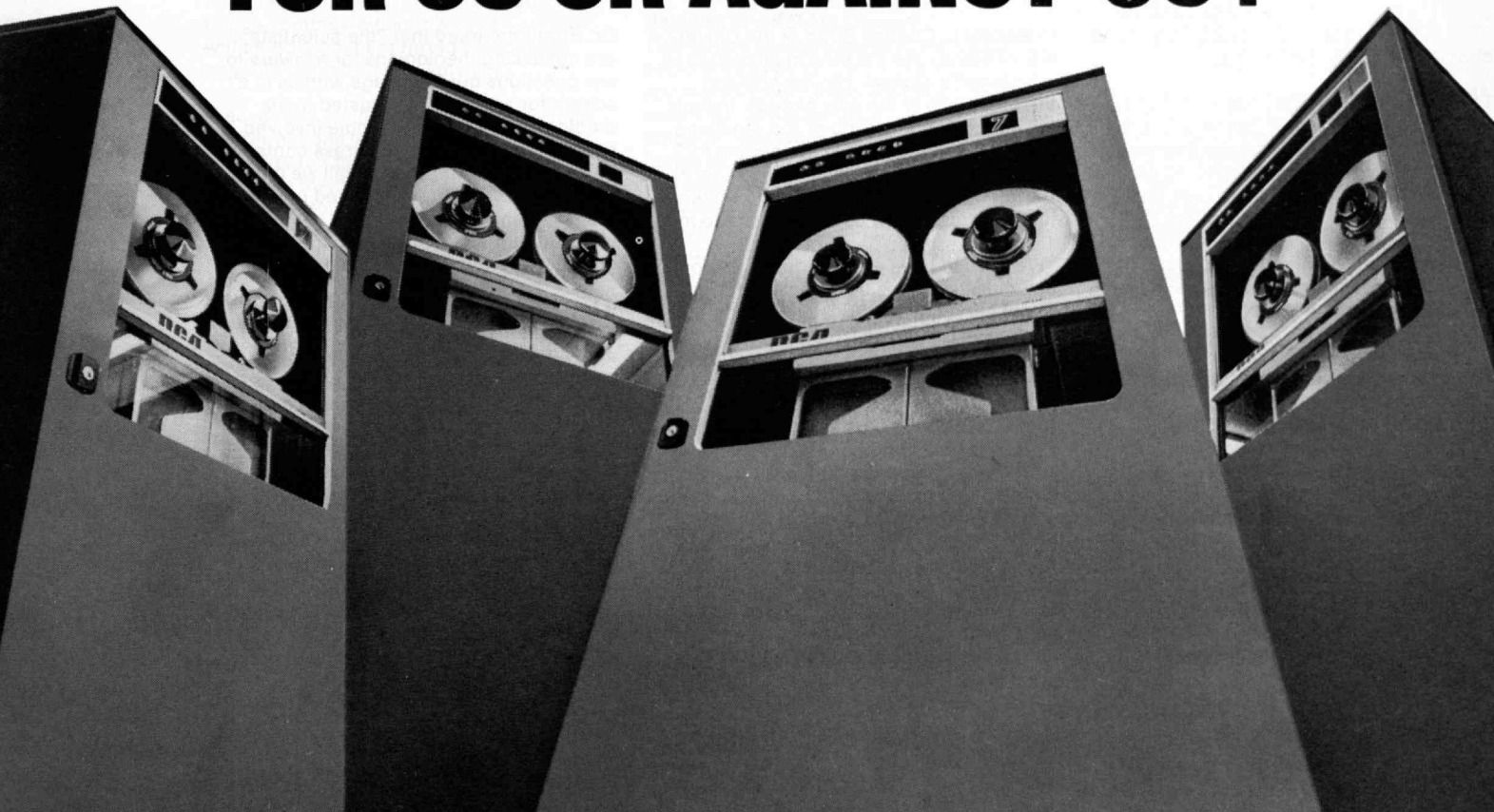
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ARE THEY FOR US OR AGAINST US?



A meeting of scientists and theologians exposes a fundamental weakness in the latter. By comparison, the church thinkers appear incompetent, unable to apply their fundamentals.

The Man of Excellent Intention

Since many scientists are trying to get "religion" these days, it's too bad more religionists haven't gotten more "science."

By "religion," I mean a moral-ethical basis from which to guide the development and use of the awesome powers science and technology are giving men. By "science," I mean a knowledgeable awareness of this challenge and how it relates to the great moral traditions the religionists represent.

Unfortunately, the positivism of the scientists and the scholasticism of the theologians have diverged for so long that the two thought modes have trouble communicating. The signal-to-noise ratio runs high between them even when they both want to grapple with the issues of man's future on this increasingly overcrowded, polluted planet. The scientists want to get down to specific thinking about specific problems. The religionists tend to float about in generalities. They seem unsure even of the principles they want to apply.

You could see this mismatch during the conference at Geneva last summer in which the World Council of Churches gathered scientists and Christian theologians from around the world to consider "The Future of Man and Society in a World of Science-Based Technology."

To give the conference its due, it didn't aim to settle any issues. The W.C.C. convened it to help identify salient themes, which it plans that various specific groups around the world will explore over the next five years. In this, the meeting succeeded. Nevertheless, the confrontation between scientists and theologians exposed a fundamental weakness in the churches' approach to the problem.

Of Right Relations of Men, But . . .

The issues discussed fall under three broad headings: man's concept of himself; his concept of his relation to his fellow men, including his posterity; his relation to the rest of life. The scientists outlined the background of these issues in the familiar semantics of gloom and doom — exploding populations, pollution, ecological mayhem, too fast a pace of change, and the machinations of the new biology.

Professor John N. Black of the University of Edinburgh put the ethical issue from

the ecologists viewpoint: "When you ask, why be concerned for the future of the world . . . you're coming very close to a problem entirely outside the science of ecology," he explained. "The whole problem of wise use of resources and integrity of nature is bound up with our sense of responsibility to the future."

The problem of environment is also bedeviled by a tendency for man to see himself apart from the ecological system. Ecologists trying to put man back into that system run counter to trends in Western thought that Dr. Black traces back to the West's Christian roots. "As I see it as a scientist," he said, "Western science and technology are grounded in Western Christian thought which sought to isolate man from nature. Oriental religions have not sought to dominate nature, to exploit it. They have sought to understand the underlying laws and harmony of the universe of which man is a part." So Dr. Black sees a need for a system of ethics that will balance the concept of dominion over nature with a sense of responsibility for nature, a sense of responsibility to limit the use of development that will be acceptable to everybody.

Professor L. Charles Birch of the University of Sidney put the ethical challenge in a biologist's context. Having outlined the prospects of the new biology, including genetic engineering or the remaking of man, he asked: "What are people for? Also what are nonhuman creatures for? It's not helpful in conservation to think just in terms of how useful they are to man."

"We have to have an attitude, an ecological ethic, that goes beyond usefulness . . . or conservation is off. To the person who asks 'Why not maximize the welfare of this generation even at the cost of posterity?' there must be a cogent reply."

And what about things like brain control? Psychological conditioning — is it ethical? How much should fear enter into our conditioning of people? On genetic manipulation, the question is not whether we should control man's genetic future, but how should we do it and in what direction?

On these matters that involve human worth, dignity, and purpose, one underlying question insistently demands an

answer — what is man? "You have to answer definitely the question scientists have tended to thrust aside," Dr. Birch said, "Is man more than a biochemical mechanism to be manipulated as may seem proper to some authority or other?" He sees man's self-image as crucial to the problems of overpopulation and limited world resources too. "We need," he said, "a radically new attitude to the sorts of goals that growth and progress set for man. This raises the whole question of What are people for?" He added that "it would be a tremendous breakthrough if the World Council of Churches should say something meaningful on the ethical-moral problems of the new biology. I really believe we biologists are pleading for guidelines."

It remains to be seen whether or not the W.C.C. will fulfill Dr. Birch's hope over the next half decade. The discussions at Geneva let him down rather badly. Instead of applying basic Christian teaching about the nature of man to questions such as those raised by Drs. Black and Birch, the theologians wandered into such obscurities as a philosophical dissection of "the myth of a future."

Dr. Birch remarked that "the scientists are not asking theologians for answers to our questions but to engage with us in a search for answers." Disgusted at the theologians' failure to become involved in such discussion, he told a press conference "there's some sort of wall we didn't get through." He later remarked privately that, if scientists handled their professional matter as ineptly as did the theologians, "you would call us incompetent."

It is Hard to be Really Useful

You could also see the same failure to apply basic Christian principles specifically when it came to ethical problems of technology and underdeveloped countries. These countries have a radically different view of technology than do advanced nations. The haves think in terms of "aid" to impoverished, population-burdened regions. The have-nots think in terms of calculated or thoughtless "exploitation."

The conference chairman, Professor S. L. Parmar, economist at India's University of Allahabad, explained how the



"Is the Christian message really to be identified with 'Westernization,' with modernization? Is this really the message we want to give the world?"—Professor Kinhide Mushakoji of Sophia University, Tokyo, at the World Council of Churches conference on "The Future of Man and Society in a World of Science-Based Technology," 1970. (United Nations photo: Dacca, East Pakistan)

thoughtless exploiter can subvert an economy like India's. He used Western makers of consumer electronics as an example. Salesmen can build up a vigorous market for such projects among a developing country's elite. This encourages high consumption among people with money to spend. Yet a country like India needs to encourage this part of the population to save to provide capital for investment. Westerners trading in developing countries or helping their industries fail to appreciate this sort of thing, Dr. Parmar said.

The "exploitation" can take the cruder form of milking a developing country of raw materials at unfavorable prices. Rodrigo Gutiérrez, dean of the University of Costa Rica's medical faculty, illustrated this by pointing out that "... during the seven years from 1955 through 1961 only, ... Latin American countries lost more than \$10,000 million due to price differences (they raise the price of the things they sell us and lower the price of the products we sell them). The Latin American countries received, from assistance and loans of all kinds, the sum of \$6,811 million ... from 1945-1962 (17 years) ... Even though foreign aid were doubled, if things continue along this road ... there will be no amount of foreign resources capable of restoring balance ..."

If advanced countries really want to help poorer nations technologically, they should teach the natives to process raw materials themselves, observed Dr. Mounir Attie, director of the Institute of Industrial Research at Beirut, Lebanon. An oil company could install a refinery and not just take out crude oil. Then the technically well-off countries would have to pay higher prices for what they take from developing nations. However, he added, "If a man has technology and the money to back it up, the other fellow has no chance at all. He has no chance unless the man with the technology, in the name of brotherhood, gives, and gives with Christian charity." "Can we really have a technology with real brotherhood built into it, built into its inner logic?" asked Professor Pyonh-choon Hahm, who heads the Social Science Research Institute at Seoul, Korea.

Here, certainly, was a plea for a new ethic

of technology and development seen in the world context. Here, certainly, is an opportunity for Christian thinkers to apply basic Christian principles of brotherhood and love for one's neighbor to help work out a new practical approach to this problem. Yet, very little was said about the Christians' Golden Rule or Christianity's teaching about the need for love and humility in such situations.

At a religious service on the opening day of the conference, someone asked, "Do you think that forgiving and being forgiven helps in facing this technological conference?" It was obvious to anyone listening to the discussions that it would have helped very much. Yet the question seemed forgotten almost as soon as it was asked. The accusations of "exploitation" against advanced countries were made with a deep sense of bitterness. There were pleas for needed charity in the approach of these advanced nations to less fortunate ones. But no one reminded the representatives from poorer countries that they too will have to rise above hate, however justified they may feel their resentment to be, if a really fruitful new ethic of development is to emerge.

Helpless in a Ruined House?

This failure of theologians to hark back to basic principles and think out fresh approaches from them is what Dr. Birch meant by "incompetence." It is an "incompetence" that weakens the churches in facing up to the challenges of science and technology today. One W.C.C. official remarked to me that "the churches couldn't find four theologians in the world who could stand with the scientists and really think these issues through." The Reverend Paul Abrecht had this failing in mind when he told the meeting he looks out on the churches and sees "tremendous weakness and disarray." The kind of confrontation provided by the conference was, he said, part of the "tremendous awakening that has to go on."

Part of this awakening will be that of church congregations who have not yet become fully aware of today's challenges to them as Christians. Without their support, even enlightened church officials are hampered. But part of the awakening will also have to be a new awareness of the relevance of basic Christian principles to

today's problems. For too long, the churches have been embarrassed by the silly clashes between rigid dogma and the discoveries of science that made churchmen look foolish in the past. Such self-consciousness has steered the churches into secular modes as they reach around the world to help where they can. In the process, Christian theologians and church workers have tended to push the basic principles of their religion into the background along with its outmoded dogmas.

Professor Kinhide Mushakoji of Sophia University, Tokyo, chided the conference about this by noting that Christian churches have gone into the world as bearers of the Western technological gospel. They have, he said, confused their faith in technology with the true Christian gospel. "Is the Christian message really to be identified with 'Westernization,' with modernization? Is this really the message we want to give the world?" he asked.

"It is a good thing to talk of our failure," said Professor R. Panikkar, Roman Catholic theologian from India. It is good, he said, to recognize the difficulty of communicating between modes of thought kept separate for decades, even centuries. And perhaps now that this has been exposed, the W.C.C. follow-up to the Geneva conference will encourage other top scientists and theologians to talk about the problems man faces. But if the theologians are to contribute fruitfully to these discussions, they must be as sure of their basic principles and of how to apply them as the scientists are of theirs.



Robert C. Cowen, who contributes regularly to this section of Technology Review, is Science Editor of the Christian Science Monitor. He is currently stationed in London.

High-energy X rays and gamma rays are changing the genetics of food- and flower-bearing plants, improving the quality and quantity of their yields, and helping us keep their products fresher longer. A report on research at EURATOM-ITAL and its neighbors

Irradiation for the Shopping Bag

On a 10-acre beech-and-oak grove near Wageningen, in the rich farm area of central Holland, stands a research station where a group of plant scientists are conducting a quiet revolution. Armed with the new atomic instruments and techniques, they are harnessing the forces of radiation to bring more and better food to the world's markets.

Starting work in a modest way in 1960, the Institute for Atomic Sciences in Agriculture, known as the Association EURATOM-ITAL, is the world's only atomic research center which is devoted entirely to the use of radiation in agriculture and the food industry. Working closely with European growers and market men, it is deeply involved in scores of projects that show great promise of practical use.

One is the technique of radiation genetics in breeding better plants. Some 15 years ago, this offspring of the atomic age was a victim of overenthusiasm. Disillusioning complexities developed. It has now survived two extreme swings of the pendulum. Improved methods have been developed by many scientists in the last few years, and radiation genetics has come of age as one of the leading methods of plant breeding.

Rebuilding Plant Genetics

For ten years, Cornelius Broertjes of the Wageningen research center has been bombarding plants with radiation to force their chromosomes into siring mutations which may be superior to existing strains. He showed me his impressive battery of nuclear weapons. There is a special reactor, in which seed specimens can be exposed to bombardment by fast neutrons; there is a Van de Graaf accelerator, which uses the lighter electrons for ammunition; there is a powerful X-ray machine; and there are shielded canisters of the radioactive isotope, cesium-137, which emits highly penetrating gamma rays. With these devices, Dr. Broertjes has been irradiating peas, beans, tomatoes, onions, sugar beets, tulips, iris, dahlias, apples, pears, and many other commercial plants, seeking bigger, better, more attractive, or more disease-resistant strains.

Most of the induced mutations are, of

course, disadvantageous, like most of those that occur in nature, but when a superior variety emerges, the event takes place in a laboratory showcase where it is easy to isolate.

Flowers, an important commercial crop in the Netherlands, have been among the first plants to benefit from the radiation technique. In the last four years, 17 new varieties developed in the Wageningen laboratory—flowers with interesting new colors, larger blooms, or other attractive traits—have been released to growers. Four new dahlias of appealing colors are now being grown commercially in the Netherlands.

Irradiated seed has also produced a promising new variety of onion which has improved resistance to neck-rot and has better keeping properties. Radiation work done for other countries has given a pinkish blush to once-dull-green apples, enhancing their sales appeal.

Dr. Broertjes' newest technique is the stimulation of isolated plant leaves to form adventitious buds, originating from a single cell. He has obtained hundreds of "solid mutants" from the leaves of the *Streptocarpus* (African primrose). These buds easily form roots and can be propagated by leaf cuttings, offering a useful short cut for the improvement of many plants.

Many of these projects are being conducted in cooperative programs with other laboratories, institutes, experiment stations, or private firms, not only in the Netherlands, but in Germany, France, Belgium, and Italy. Among other prospects are faster-growing elms, disease-resistant pines, tenderer spinach, peas with more pods per plant and more peas to the pod, and easier-peeling tomatoes. Some superior new plants developed by the Association's clients may appear on the market with no fanfare, to give their owners a temporary competitive advantage.

Another goal is the creation of smaller, more compact fruit trees, with "spur type" fruit-bearing branches closer together. Tall trees are harder to spray, and long ladders are needed to pick the fruit. ITAL scientists have irradiated

fruit-tree scions with gamma rays in a program to secure shorter, bushier branches. These are being grafted onto vigorous stock in a search for smaller trees that will retain the sturdiness of the parents. Smaller pear trees would reduce labor costs, and Dr. Broertjes hopes to produce a small cherry tree which might restore the vanished cherry culture to the Netherlands.

The worldwide impact of this technique, as reported last year by the International Atomic Energy Agency, is impressive. Seventy-seven new varieties of plants had been developed in 13 countries, including grains, fruits, legumes, and ornamentals, and about 50 of them had been released during the previous five years. Says Dr. Broertjes, "In other branches of technology we have been rapidly reshaping our environment, but we continue to use many crop plants that are obsolete. Radiation genetics will not supplant all other methods, but it has given us an important new tool that will help us to rebuild our crops to fit our needs."

Apples: Two Tons an Hour

In another part of the Association's grounds, Robert M. Ulmann, a zealous young chemist, showed me a food irradiation plant which is already bringing benefits to European consumers. In this streamlined, automatic processing plant, big doors at one end admit truckloads of potatoes, fish, meat, fruit, vegetables, eggs, grain, and other foods, and long conveyors carry the foods slowly through concrete-walled chambers where they are irradiated to kill bacteria and mold and inhibit cell growth.

There are two treatment chambers. One contains a radioactive cobalt slug which emits a stream of gamma rays powerful enough to pass through the walls of the aluminum canisters in which the food is dispatched through the chamber and kill all decay organisms. In another chamber, foods that need only surface treatment are bombarded by an accelerator with less penetrating electrons. Hard fruits like apples, which can be rolled to receive the electron stream on all sides, will pass through this chamber at a rate of perhaps two tons an hour.

While background research for food irradiation was done by the Association, the pilot plant is a separate venture, built and equipped at a cost of 2,500,000 guilders (\$600,000) by the Netherlands Department of Agriculture and several food-marketing boards representing the crop-growing industry. So the foods now treated were selected largely by growers themselves as most likely to pay off in the near future.

"Our aim," Dr. Ulmann explained, "is not to sterilize food so that it will last for months. We can do that, but it changes some of the flavor, odor, texture, and color, and there is no need for such long preservation, except perhaps for emergency rations to be cached in remote areas. We give the foods a lower dose of radiation which pasteurizes them without heat, so that they remain fresh twice or perhaps three times as long as they do today.

"We can pasteurize fish fillets, already cleaned and packed, so that they will remain fresh in a refrigerator at 40°F. for two weeks or more. This fish, with its fresh flavor and texture, may supplant frozen fish in chain stores. The treatment costs no more than \$.01 (U.S.) per pound, and in bigger plants it should be cheaper. Beef, ham, bacon, and chicken also offer possibilities."

For several years the Association has been cooperating with the food industry in the irradiation of soft, highly perishable fruits like strawberries, which suffer a high percentage of spoilage on the way from the field to the table. Tests have been most successful. Treated strawberries last two or three times as long as untreated fruit. In some tests, berries survived four days on the shelf at room temperature. Kept in a refrigerator, they may last for a week or ten days. Mushrooms, which "flower out" and deteriorate if kept too long, have kept their flavor and appearance for ten days or more after irradiation. A panel of tasters preferred their flavor to that of untreated mushrooms.

Longer Freshness for Fresh Foods

Last June the treated mushrooms were cleared for general consumption and went on sale in a leading Holland chain

store in packages marked by a special symbol (a flower in a circle). They were the first irradiated food to appear on the market in Western Europe. Irradiated potatoes have also been cleared, and I saw tons of them rolling through the Dutch plant. Normally, potatoes sprout in storage—a cause of great economic loss. Gamma rays kill their "eyes" (buds) so they cannot sprout. Dr. Ulmann uses the same method to keep onions from sprouting, and tomatoes are being experimentally irradiated to delay their ripening. A score or more of irradiated food products are being distributed in test areas to gain marketing experience.

"Irradiation will greatly extend the market area of many fresh foods," predicts Dr. Ulmann, "We'll be able to fly fresh foods everywhere, or ship them more cheaply by boat or train because of their longer life. Housewives can shop less often, and the output of tin cans and garbage will be reduced."

Consumers' reactions, prejudices, and whims are most important in introducing new food processes, so the pilot plant group works closely with an advisory board of food authorities and housewives' organizations. Irradiated foods are prepared and served in the canteen of the Institute for Home Economics Research in Wageningen. Volunteers, mostly civil servants from the local university, eat the food, and their opinions are recorded.

In lecturing before housewives' groups, Dr. Ulmann sometimes encounters fear of anything connected with atomic energy, and he always takes pains to explain a fact buttressed by tests in many countries for over a decade—that the irradiated food does not itself become radioactive and can cause no physical damage. Like all preservation treatments, including pasteurization by heat, dehydrating, freezing, salting, or canning, irradiation may cause some changes in taste; but in most cases these changes are not objectionable.

Super Onion Flies on a Fortified Diet

Not far away from Dr. Ulmann's domain, I dropped in at the Institute of Plant Pathological Research (called I.P.O.),

where H. J. de Fluiter showed me plastic cages of trapped onion flies. Their mating habits are being observed, preparatory to the release of millions of sterile males in the big Dutch market gardens. For this purpose, I.P.O. is raising super-flies on a fortified diet, irradiating them only enough to make them sterile, without impairing their vigorous appeal to the female. Used as an adjunct to chemical sprays, this technique should ensure effective control of the costly pest. In other laboratories in the area, botanists are studying such matters as the effects of light on greenhouse crops and the new technique of CO₂ fortification of the greenhouse atmosphere.

"One of the Association's greatest assets," says Dr. Broertjes, "is our ideal location in a scientific community. One of our fine neighbors is the Netherlands Agricultural University at Wageningen. In all there are 80 institutions in this area, where about 800 plant scientists are working on all known aspects of soils, plant growth, and diseases. Whatever problem arises, you can reach an expert in 15 minutes." While Wageningen's quiet forests and winding lanes hardly suggest the Brave New World, such rapid cross-fertilization of ideas may soon be reflected in every housewife's shopping bag.



Harland Manchester, one of the nation's senior science writers, is Roving Editor of The Reader's Digest.

Foreseeing the nation's choice between the "relatively small hypothetical risks of the nuclear energy industry and the very real risks of power shortages or a smog-polluted environment," the Atomic Energy Commission is convinced that "the moving finger points to nuclear power." The management of high-level waste material is clearly the issue to be faced.

Toward Nuclear Power

The cost to the rapidly expanding nuclear power industry of meeting restrictions on releasing low-level radioactivity into the environment 10 times more strict than those now in effect would be little or nothing. To do so would fully meet demands of some of the most strident environmentalist critics of nuclear power.

These points emerged during a week-long conference on the environmental impact of nuclear electricity-generation, held during August at the New York headquarters of the United Nations. The conference, sponsored by the International Atomic Energy Agency at the invitation of the U.S. Atomic Energy Commission, represented a mobilization of the world's nuclear energy specialists for an intensifying battle with pollution-conscious opponents.

Karl Z. Morgan of the Oak Ridge National Laboratory, the senior member of the International Commission on Radiological Protection (I.C.R.P.), said that the average dose of radioactivity for each resident of the U.S. from operating nuclear plants is about 0.5 per cent of the limit set by the Federal Radiation Council after recommendations from the I.C.R.P. (a semi-official international group of scientists and physicians).

The average dose from nuclear facilities is about 0.85 millirem per year, about six times lower than the maximum annual impact from testing nuclear weapons in the atmosphere in the early 1960's (5 millirems) and more than 60 times lower than the average dose to each person from medical uses of radiation such as X-rays (55 millirems).

The recommended limit of 170 millirems per year is about what a resident of Denver gets each year from such natural sources as cosmic rays (being one mile above sea level, a Denver resident has a good deal less air above him and gets about twice as much cosmic radiation as does a resident of New York City).

The term millirem, incidentally, stands for one thousandth of a "roentgen equivalent, man," or a rem. One rem denotes that dose of radiation in living tissue which produces the effect of one roentgen of X-rays; one roentgen produces 2

billion ion pairs in a cubic centimeter of air or about 1.8 trillion ion pairs in a gram of living tissue.

Evaluating Safeguards and Risks

Dr. Morgan made a complex review of the maximum dangers that could be expected from current standards, which conservatively disregard the effects of low dose rates, at which living tissue seems to have greater ability to repair radiation damage. If U.S. population doubles by the year 2000 and the current average radiation dose goes up 10-fold, he said, there could be 360 extra deaths attributable to operating nuclear plants and 2,800 more introduced each year into future generations through genetic changes.

Dr. Morgan also tried to assess the risks from a really disastrous nuclear power plant accident that might cause 300 to 2,300 extra deaths. With a stock of 200 operating power reactors and an assumed risk of accident of one in 10,000, much higher than expected, then the chances of a big nuclear plant accident are one in every 50 years, Dr. Morgan calculated, making the risk of death equivalent to the crash of one fully-loaded 747 jet in the same period. Similar numbers of people are killed on three-day weekends on the highways.

Dr. Morgan concluded that "the choice therefore seems to be between these relatively small hypothetical risks of the nuclear energy industry and the very real risks of power shortages or a smog-polluted environment and the associated respiratory diseases we might expect from fossil fueled power plants."

Nowhere in Dr. Morgan's paper was there an assessment of the assertions of two Livermore, Calif., researchers, John Gofman and Arthur Tamplin, likewise paid by the A.E.C., who claim from a theory of incremental risk of cancer from each added dose that there would be 32,000 extra deaths each year if nuclear power plants released the entire 170 millirem average dose to the environment (whose distribution, of course, is not at all uniform and in fact affects few except those who live near the point of release).

The burden of rebutting Drs. Gofman and

Tamplin has been carried by others, chiefly Victor P. Bond of the Brookhaven National Laboratory, who has asserted that the two Californians are off by a factor of more than 100,000. Dr. Bond's arguments were taken up by Theos J. Thompson, a reactor safety expert who was appointed from M.I.T. to the A.E.C. last year, in a speech in Columbia, South Carolina, last May 21.

Dr. Thompson said, "It is clear that Dr. Gofman is wrong, and wrong by a large factor . . . Instead of having 32,000 cases per year, we probably have statistically less than one extra case of cancer or leukemia as a result of the presence of those nuclear reactors now in operation, under construction or definitely planned."

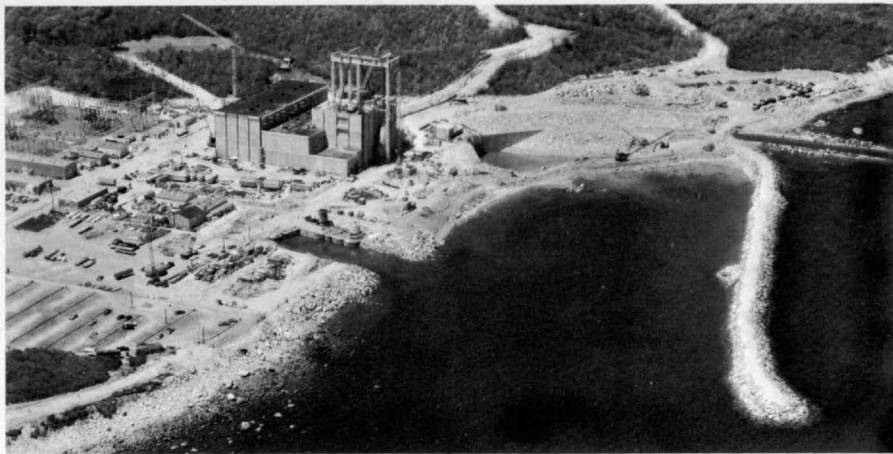
Nonetheless, Dr. Morgan's figures, presented in New York, showed that the A.E.C. could, if it wanted to, cut ground from under its extreme critics by arbitrarily tightening its radiation standards. Dr. Morgan made it clear in a press conference that much of what Drs. Gofman and Tamplin have sought will happen anyway.

Dr. Morgan noted that he had testified to Congress last January that A.E.C. operations would not be hurt "in any wise" by a 10-fold tightening of radiation release standards. It was never contemplated, he said, to allow nuclear power plants to even approach the total average dose allocated by radiation protection standards. Room must be left for other uses of radiation, such as the medical one, and for things that have been overlooked. He strongly criticized the Federal Radiation Council for not making some allocation among the various uses of radiation.

On the theory of never approaching limits of risk, Dr. Morgan continued his advocacy of siting nuclear power plants well away from population centers until there has been more operating experience.

The Problem of Wastes

Potentially much more serious than the risks of low-level radiation continually released from power reactors, Dr. Morgan said, was the risk in handling the ultra-high-level radiation which results from the build-up of fission products in fuel elements which then have to be with-



In projects such as the Pilgrim Station of Boston Edison Co. at Rocky Point in Plymouth, Mass., U.S. utility companies are gradually building their experience in planning and operating nuclear-powered generating plants. Pilgrim Station (shown here as it appeared in May, 1970) is a 650,000 kw. boiling-water reactor designed and built by General Electric Co., scheduled for completion in 1971. (Photo: Aerial Photos of New England, Inc., from Boston Edison Co.)

drawn from a reactor, stored in vats of water, sent to reprocessing plants in huge casks, and dissolved to recover the "unspent" uranium.

Although fuel elements are being designed so that they can remain longer in reactors before they are "poisoned" by fission products, and although fuel reprocessing plants are becoming increasingly efficient, there still is a large residue of highly radioactive waste. This material actually boils off itself when stored as a liquid in underground—and slightly leaky—vats at places like Hanford, Wash., Savannah River, S.C., and the new private reprocessing plant of Nuclear Fuel Services Inc., owned by the Getty oil interests, at West Valley, N.Y.

Ideally, Dr. Morgan said at his press conference, one should have liquid-fueled nuclear power plants of the molten salt type now being tested at Oak Ridge, in which fission products would be continually withdrawn to a reprocessing plant on the spot. Until then, he argued, the number of fuel reprocessing plants operating in today's conditions should be kept to a minimum. Plans are well along for three new private fuel reprocessing plants, one to be constructed by General Electric near Morris, Ill., and the other two in South Carolina by Allied Chemical and Atlantic Richfield.

The A.E.C. has long been dissatisfied about the existence of some 80 million gallons of high-level waste in tanks that are not expected to last more than 40 years, from which an estimated total of about 15,000 gallons has leaked. For several years, there has been an experiment at Hanford where immersion heaters are put into the waste tanks to convert their contents to a salt cake that would be much less likely to permit leakage.

At the National Reactor Testing Station near Arco, Idaho, the A.E.C. has been experimenting with a fluidized bed process in a so-called Waste Calcining Facility. Wastes with large proportions of aluminum nitrate or zirconium have been converted successfully into solids. Meanwhile, at the Waste Solidification Engineering Prototype of the Battelle Northwest Laboratories near Hanford, there have been experiments with spray solidi-

fication, pot calcining and phosphate-glass processes, achieving 10-fold reductions in the volume of most wastes.

These experiments have been the underpinning of an important move by the A.E.C. to gradually require the solidification of all nuclear plant waste so that it can be stored in formations like that of the Lyons, Kansas, salt mine, where an experimental burial of highly radioactive material in steel drums was carried out in 1965-67. On June 17 this year, the A.E.C. announced its intention to set up the repository at a cost of about \$25 million in the Lyons mine, which lies in the middle of a very thick, 10,000-square-mile salt formation some 150 miles from the nearest ground water.

Its intense work on high-activity wastes shows how seriously the A.E.C. takes this problem, even though it does not say much about it in public pronouncements. It is clear that the potential generation of vast quantities of strontium-90, whose radioactivity will not sink to safe levels for 1,500 years or more, could be a serious millstone around the A.E.C.'s neck.

The English monthly *Science Journal* published a worried treatment of the high-level waste problem in its August issue, written by Frank Barnaby, the executive secretary of the Pugwash movement. Dr. Barnaby noted that "in the years ahead, the amount of radioactivity stored as waste will come to equal the total fission product yield of a hypothetical all-out nuclear war," and he said that better controls for such waste will have to be worked out before mankind is assured that the benefits of nuclear power are worth the risks.

Somewhat the same note was sounded in July by the month-long Study of Critical Environmental Problems at Williamstown, Mass., led by Carroll L. Wilson, M.I.T. Professor of Management. Without the time to look at the problem in detail, S.C.E.P. recommended "that an independent, intensive, multi-disciplinary study be made of the trade-offs in national energy policy between fossil fuel and nuclear sources, with special focus on problems of safe management of the radioactive by-products of nuclear energy, leading to recommendations con-

cerning the content and scale and urgency of needed programs."

A.E.C. feels it has the answers. The total amount of waste expected to be generated by the entire civilian nuclear power program between now and the year 2000, according to the A.E.C., is 60 million gallons, or less than the amount already generated. This estimate is based on an average of 100 gallons of high-level waste per ton of "spent" fuel reprocessed, compared with a 400-gallon average now at the Nuclear Fuel Services plant. If solidified, the wastes would amount to 600,000 cubic feet, which would be distributed over much less than a square mile's worth of Lyons salt vaults.

The Moving Finger Points

The A.E.C. sees increasing pressures toward an all-electric economy. Alternate sources of supply, like volcanic steam, the tides or solar panels, will provide only tiny fractions of the need. The amount of petroleum recoverable from oil shale or tar sands is not clear. And even the supply of lithium, the critical item for the shortest route to thermonuclear power, is limited, according to a study by M. King Hubbert of the U.S. Geological Survey which he expounded at New York.

The A.E.C. is convinced that the moving finger points to nuclear power, a mixture of today's designs and the so-called "breeders" for which it now is struggling to obtain development money. Without breeders, the supply of nuclear fuel would swiftly run out.



Victor K. McElheny, a regular contributor in this space in Technology Review, is Science Editor of the Boston Globe.

Under the leadership of its new atomic energy commissioner, India is determined to develop a modern technology of nuclear power, nuclear weapons, and space exploration. But at what financial cost and with what social and economic repercussions will this be achieved?

India's Nuclear Nectar

India is unique among the developing countries of the world. It is a land of violent contrasts—in geography, climate, social creeds, economy and even science and technology. It is one-third the size of the U.S. and half that of the Australian continent, yet its population is 45 times more than that of Australia. At 163 persons per sq. km., India's population density is three times that of the U.S. and five times that of the world (average). While half the people go without a decent meal, the population is increasing at 13 million a year—25 children are born in India every minute!

Sixty million farming families contribute to Indian agriculture, which yields 51 per cent of the gross national income of \$32 billion. In India 50 per cent of the total area is available as arable land, compared to only 20 per cent in the U.S., 10 per cent in Russia, and 5 per cent in Australia. Yet one Indian farmer produces food for *three* people while one American farmer produces food for *thirty* people. Bullock carts still outnumber automobiles 12 to 1.

Many engineers are surprised to learn that the world's highest and largest dams and the longest irrigation canals are in India; it has the second longest railway system, the largest electric power system, and the largest conglomeration of national research laboratories among the developing nations. It has begun deep-sea exploration, successfully established a space science center, and built jet engines and some of the most sophisticated electronic equipment. India is now reckoned as one of the eight most advanced nations in nuclear technology and has the largest thorium deposits in the world.

Alongside the first atomic power plant at Trombay, the village folk still use cow dung as fuel. But in terms of power generation and utilization—which are reckoned as rational yardsticks of progress—India has achieved a significant record by world standards. In 1947—when India attained independence—the country's installed capacity was 1,900 Mw. In March, 1970, it was 15,600 Mw., and this is expected to be 23,100 Mw. by 1974. Per capita power consumption in 1947 was 12 kwh. Currently—despite the

rapidly increasing population—it is 83 kwh.—a seven-fold increase. (However, by world standards this power consumption remains negligible; in the U.S. the figure is 6,000 kwh., in the United Kingdom 3,200 kwh., in Russia 2,300 kwh., and in Japan 1,800 kwh.)

Amazement, Anger, and Satisfaction

Vikram Sarabhai, Chairman of India's Atomic Energy Commission, recently presented a ten-year plan for nuclear development and power enhancement, proposing an outlay of \$1.9 billion. Dr. Sarabhai, who thinks and plans much faster than his government can act, has thus simultaneously amazed, angered, and satisfied his countrymen. This attitude is understandable in a country where 82 per cent of the population is rural, 76 per cent are illiterate, and 70 per cent are involved in agriculture without being in the least aware of what nuclear energy is.

Dr. Sarabhai's proposals are technologically interesting and financially intriguing. Today the country has one nuclear power plant of 400 Mw. capacity. When two more plants now under construction are completed by mid-1970 (at Rana Pratap Sagar and Kalpakkam), a 1,000-Mw. power block will be available. Thereafter Dr. Sarabhai proposes to have four new atomic plants to produce 1,700 Mw., thus bringing the total target to 2,700 Mw. by 1980. The original target set by the Department of Atomic Energy in 1954 was 8,000 Mw. for 1980, and this has now been reduced for lack of financial resources and technical reasons.

Among Dr. Sarabhai's proposals are the development of gas centrifuge technology for U-235 enrichment, construction of a large 500-Mw. prototype fast breeder reactor, the establishment of a new reactor research facility in south India employing 3,000 to 4,000 persons and working independently of the Bhabha Atomic Research Center at Trombay, augmentation of heavy water production to nearly 300 tons per year to back up the use of natural uranium in reactors, and widening the use of isotopes in industrial processing, food preservation, and medicine. The ten-year plan also includes a space research program to place into orbit a 40-kg.-payload satellite, and

other advanced rocket systems, fabrication of communication satellites, the development of other ancillary aids such as inertial guidance systems and high-performance missile-tracking radars, and manufacture of solid propellants.

Yet another sphere which the Department of Atomic Energy intends to penetrate is the establishment of an agro-industrial nuclear complex. While India claims no originality in this concept, the fact that this nation has actually worked out the project in detail is an achievement in itself; if implemented, the project would place India as the first nation anywhere in the world to have such a complex. Dr. Sarabhai, who is keenly interested in this project, has emphasized the need for having two such complexes—one in Western U.P. and another in Saurashtra. The former, covering an area of 1.5 million hectares in the northeastern part of India, envisages energizing 25,800 deep and shallow tube wells to procure abundant subsoil water for agriculture; there is planned an aluminum plant with a capacity of 50,000 tons per year and a fertilizer plant producing 1.2 million tons per year, all powered from two 600-Mwe. reactors.

The second site in the Kutch Saurashtra area on the western seaboard would produce 50,000 tons of aluminum and would operate a desalination plant yielding sufficient water for double- and three-crop rotation agriculture to yield nearly 200,000 tons per year of hybrid corn, 40,000 tons per year of potatoes and 50,000 tons per year of peanuts.

By any yardstick, these are gargantuan proposals—very nearly complete details of which have been planned. Only the implementation now awaits the Cabinet's green light. As Dr. Sarabhai has opined, the main difficulty in a project of this magnitude is less likely to arise from lack of financial or technical resources than from the demands for managerial skill and organizational structures catering to its complex needs. With an investment of nearly \$3.3 billion—which is colossal by Indian standards—these two projects may come up against a dead end when presented to Parliament for approval. Notwithstanding Dr. Sarabhai's earnestness and the probable return on invest-



The great conundrum: India's population is immense and increasing at 13 million a year, its density five times the world average, and half of them are without decent food. Yet India is now reckoned as one of the advanced nations in nuclear technology—and has plans for 2,700 mw. of nuclear power, computers, and a major space program by 1980. (Photo: United Nations)

ment in terms of water and food sufficiency, the very concept of investing such a huge block of money is certain to be criticized, especially when it is a plunge into a virgin field not so far undertaken anywhere in the world.

More Questions Than Can Be Answered

Of the items in the main ten-year plan, the space program appears least ambitious and most favored. Its counterpart in the nuclear power field has raised more questions than can be answered, particularly on gas-centrifuge technology. It is argued that this is also a simpler and more direct route to thermonuclear weapons manufacture and would therefore go against the basic tenets of this country's policy. Furthermore, can India afford such a colossal plan especially when ordinary necessities of life like food, shelter, and adequate transport are still not available to the vast majority of Indians?

Dr. Sarabhai has explained that it was decided to go in for the centrifuge technology in preference to natural uranium reactors moderated by heavy water because of the potential for lowering capital costs of reactors. There is, in fact, a striking contrast between the low capital

costs of the Tarapur station which uses enriched uranium and the station at Rana Pratap Sagar (Rajasthan) which uses natural uranium moderated by heavy water. The difficulty is that both the gas centrifuge and the fast breeder reactor are still undeveloped even in the advanced countries of the world. In knowledgeable circles it is felt that the gas centrifuge project would cost around \$200 million and its establishment would be unjustifiable, unless its products are exported. In fact Dr. Homi Bhabha, Dr. Sarabhai's predecessor, had ruled this out as highly expensive. Even when fast breeder reactors appear on the scene the aggregate demand for plutonium plus enriched uranium would not justify investing such a large sum on one project alone—unless, of course, the country intends to go in for nuclear explosives even for 'peaceful' purposes. Perhaps it was with this in mind that Dr. Sarabhai raised a hornet's nest when he made a reference to the possibility of making thermonuclear devices for underground explosions to harness the rich resources like oil, shale, and minerals.

According to Dr. Sarabhai, his ten-year budget for 2,700 Mw. of nuclear power is based on the minimum needed to yield

the plutonium dividend necessary to fuel an ongoing power program based on fast breeder reactors. The nuclear nectar resulting from all these proposals is both complex and confusing. China's launching of a satellite, the Indian government's decision within a month thereafter to expand its atomic and space program, the possible use of enriched uranium and—last but not least—the vehement demands by a section of the country to make nuclear weapons, are clear indications that India is thrusting itself forcefully into the world's nuclear arena and determined to overcome its backwardness through modern scientific methods. But at what financial cost and with what social and economic repercussions will this be achieved?

S. K. Ghaswala is a consulting engineer in Bombay who is Technical Editor of the Indian and Eastern Engineer; he is a member of the Indian Science News Association and the Honorary Secretary of the Bombay Region of the Science Writers Association of India.

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Vic Taylor is a corrosion specialist for International Nickel at its testing lab in North Carolina.

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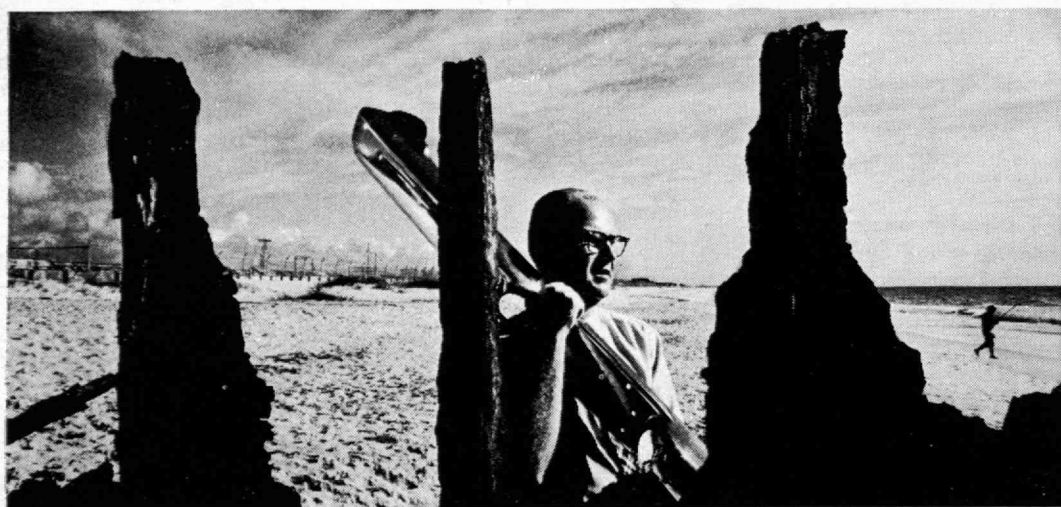
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Durations and Intensities

Doc's Magic Lamp

Electronic Flash, Strobe

Harold E. Edgerton
New York, McGraw-Hill, 1970,
362 pp., \$22.50

Reviewed by
David B. Eisendrath, Jr.
Technical Editor
PMI (Photo Methods for Industry)
Magazine

It is difficult to write an objective review when one is involved emotionally and by profession with both author and subject.

Harold E. Edgerton, Institute Professor Emeritus at M.I.T., is a man who is not only a world authority on the subject of electronic flash and high-speed photography but also one of the finest and most enthusiastic teachers anywhere. His immense erudition, his learned publications in scientific journals, and the recognition and accolades which have been bestowed by colleagues and scientific societies in diverse fields might make one expect his latest comprehensive discourse on electronic flash to be exotic and profound. It is both—and also a highly readable, enjoyable, and realistic look at the state of the art—a book which will become a definitive work in the field.

Over 31 years ago Dr. Edgerton published (along with James R. Killian, Jr.) *Flash, Seeing the Unseen* which became the classic introduction to the field of electronic flash photography. When the second edition was published in 1954, the subject was a familiar one, and even amateur photographers were employing this fascinating new illuminant as a matter of course. Although the earlier book ended up as a coffee table display volume, filled with color and black-and-white photographs of action-stopping eye-stoppers, *Electronic Flash, Strobe* will end up on the desk and laboratory table of engineers, scientists, and researchers. The day of novelty has long since passed; electronic flash is now a fact of life for everyday studio portraiture, for photographing the bottom of the ocean, even for lighthouse beacons—as a matter of sheer practicality.

Perhaps the key to the assured success

of this book is recognized by the author himself in the preface: "... I have made considerable effort in this book to keep the material practical and realistic. The reader will notice that theory is kept to a minimum and that I return again and again to actual devices and circuits." As a result, the entire work is both readable as a comprehensive treatise, rounding up some 40 years of Edgerton's love affair with the magic lamp, and at the same time an invaluable reference for the engineer designing a piece of equipment, the scientist anxious to solve a problem, or the photographer who needs unusual equipment for a specific application.

Those who have worked with the author as student, colleague, or associate will be amused and delighted to hear "Doc" speaking on every page, straightforward, every paragraph deceptively simple but packed with facts and pronouncements. Amateurs may find themselves thrown by the engineering jargon and some of the mathematics, but the author has suggested that the tyro also study *The Radio Amateur's Handbook* to pick up some of the basics.

And the work is not intended solely for the engineer, for some of its goodies are sections on how to troubleshoot an electronic flash circuit that isn't working, as well as what to look for (and what questions to ask) when you go to buy a new unit. On the other hand, chapters such as "Spectral Output of Flash Lamps" contain material and data rarely published, and for the serious electronic flash man, worth the price of admission alone.

Other sections contain such exotica as "Theory of the Electronic Flash Lamp," "E.F. Lighting Requirements for Photography," "Techniques of Light Measurements," "The Stroboscope," and a fascinating chapter on "Specialized Applications." For those who would become expert stroboscopists, Dr. Edgerton has included a dozen "experiences" or do-it-yourself projects with suitable questions to stimulate proficiency in various facets of the subject. Students of "Doc" Edgerton will remember his firm conviction that *experiments* may not always produce positive results but *experiences* always teach you something.

Teaching is one of Edgerton's special abilities, and the enthusiasm and excitement, the exuberance which all who know him associate with him, is evident in every section of the book, from a single or triple exclamation point which marks some comment or admonition, to the sly humor which amuses, as when he warns that if you should find one of his under-sea camera rigs on the bottom of the ocean, to be sure to develop the film! ("Probably the best that I have ever made," he says.) The competence of the author is apparent from the first chapter, but whether discussing theory, design, gadgetry or use, the work is full of excellent references and bibliography.

It is impossible, of course, in such a book to include everything. Indeed, a lifetime of experience is already presented. This reviewer, however, feels that if some comments of critical nature are to be made, they should not be directed at the author, who has done an outstanding job, but rather at the editor, unnamed, who might have tightened up some areas which disturbed and disappointed me.

Although there are a minimum number of errors of grammar, it appears that the editor was not especially familiar with the field and did not check out or update references in a field where revision and change occur frequently. For example, references are made to U.S.A.S.I. (United States of America Standards Institute) which over a year ago had its name and structure changed to A.N.S.I. (American National Standards Institute). And I was surprised that reference was not made to Standard PH 3.40, which has to do with American Standard Method for Measuring and Designating Performance of Photographic Electronic Flash Equipment.

In a number of cases some data is presented with A.S.A. film speeds that are many years old. And I found it particularly disappointing that only casual reference is made to Reciprocity Law Failure, since in determining exposure at very short exposure (flash) times, this is a major problem and one not always well understood. On the same subject, I missed references to adjustment in processing to compensate for effective film speed loss due to reciprocity effect, and would also like to have seen some data

To express his affection for a life-long teacher, Gjon Milli—who himself graduated from M.I.T. in 1927—made this photograph of Peter Konde a few months after Mr. Konde had entered M.I.T. as a member of the Class of 1964. The milk drop “crown” was one of the first achievements of strobe photography—and remains a “trade mark” of Professor Edgerton’s laboratory.

on color shift due to differences in response of different color emulsion layers.

It is impossible to be all-inclusive when listing equipment, materials, components, etc., but this reviewer was somewhat disappointed to see some of the more modern gadgetry not mentioned or referred to, or to find references to distributors who no longer handle the equipment which the book attributes to them. Perhaps I am expecting too much for a book with a publication date of May, 1970; it would be quibbling to expect up-to-the-minute inclusion of everything. The omissions and errors appear to be more the fault of editor than author; perhaps the former was in great awe of the latter!

I firmly believe that this work is a major one in the field, a contribution that will long be used as a standard reference, text, guide, and handbook, as well as a source of inspiration. For those involved in engineering and scientific or applied photography, the book should not be on the shelf but on the desk and worktable of the practicing stroboscopist. Never before has so much information on the subject been presented so thoroughly—nor so well.

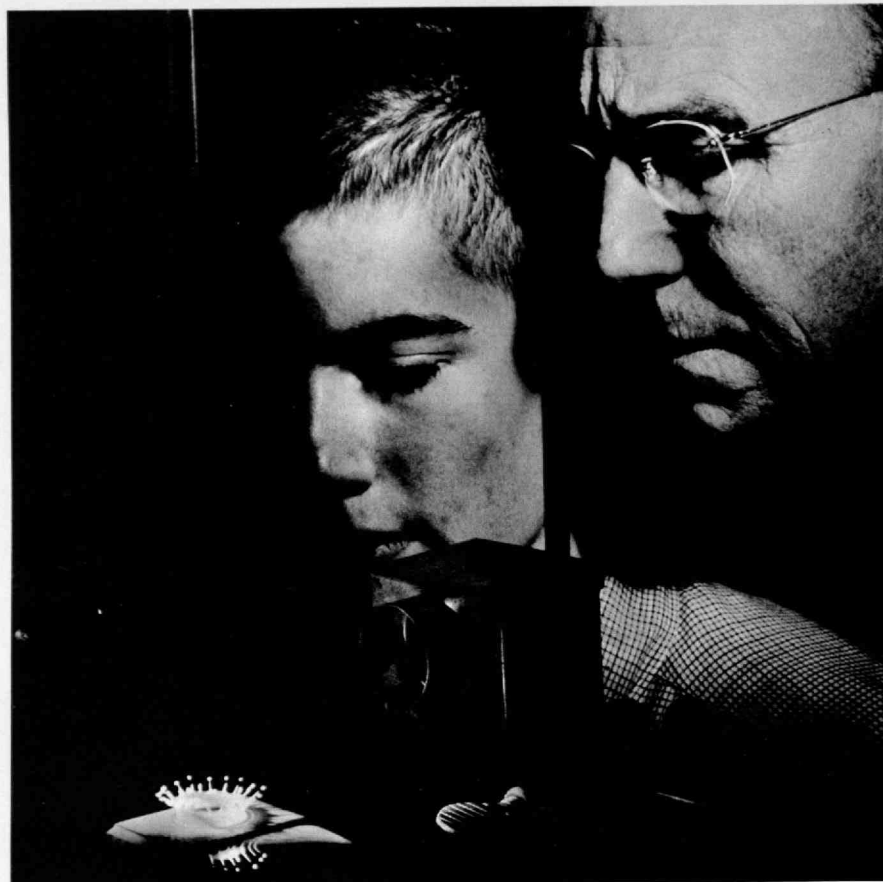
Chronicle of Arms

SIPRI Yearbook of World Armaments and Disarmament 1968/69

Stockholm International Peace Research Institute
Humanities Press, New York, 1970,
440 pp., \$13.00

Reviewed by
Geoffrey Kemp
Professor of International Security
Affairs, Fletcher School of Law and
Diplomacy; Research Associate, M.I.T.
Center for International Studies

At the height of the Cold War, it was very easy for American scholars in the social sciences to obtain research money to study issues related to the problems of war and peace. As a consequence, vast quantities of material were disgorged from the numerous private and public institutions geared to the study of international conflict. The focus of this research was primarily on matters di-



rectly related to the central balance of power—nuclear strategy, alliance relations, Communist studies. Comparatively little scholarship was devoted to the military and political problems of areas such as Southeast Asia.

The quality of this work was mixed. Although a great deal of rubbish was produced, there were some genuine intellectual and policy-relevant breakthroughs, especially in the field of nuclear arms control. The pressures for the Partial Test Ban Treaty of 1963, the establishment of the hot line between Washington and Moscow, and the lobbying for the Nuclear Nonproliferation Treaty could be traced in part to the writings and discussions of the American academic community.

During the past two years, all this has changed. Funds are no longer readily available, and the administration, Congress, and much of the academic community itself have become suspicious of “war-related” social science research. And yet a glance at the widespread chaos and conflict throughout the world should point to the need for a continuing effort on the part of scholars to study this unique feature of the human race—its capacity to wage sustained and almost unlimited intraspecific warfare.

The belief that war must first be understood before it can be controlled is not new. A great deal of pioneering work on this subject was undertaken by Quincy Wright at the University of Chicago during the interwar years and by various commissions and committees of the

League of Nations during that same period. However, the continuing vertical and horizontal proliferation of nuclear weapons, and the concomitant decline in research money in the United States, have made the efforts of scholars and institutions in other countries to understand the dynamics of conflict even more important as we enter the 1970s.

For this reason alone, the publication of the Stockholm International Peace Research Institute (SIPRI) *Yearbook of World Armaments and Disarmament 1968/69* is to be doubly welcomed. This reference book, which is to be an annual publication, will serve as an excellent complement to the annual surveys of the London Institute for Strategic Studies, the *Military Balance* and *Strategic Survey*. It is particularly heartening to know that SIPRI’s research focus in this and other publications is on relevant “real world” issues of conflict and has not been sidetracked into the intellectually stimulating but Alice in Wonderland world of many of the mathematically and behaviorally oriented “peace research” institutes.

The *Yearbook* is divided into two parts. Part I describes the major military events of 1968/69 and has three chapters, one dealing with world military expenditures, a second which discusses the technological arms race, and a third which describes disarmament and arms control efforts since 1945. Part II is devoted to reference material and will probably be of most long-term value to scholars. In particular, the tables listing world military expenditures since 1945,

the summary of post-World War II conflicts, the 1945-69 disarmament and arms control chronology, and the Arms Trade Register make the *Yearbook* a worthwhile purchase, which no serious student of international politics would want to be without.

This is not to imply that the *Yearbook* is without weaknesses. First, some nit-picking but telling errors are to be found in some of the tables on arms transfers to the Third World. For example, a very impressive chart on page 47 lists "The Spread of Long-range Surface-to-Air Missiles among Third World Countries." Lumped together in this list of "long-range missiles" are such different systems as the nuclear-capable Nike-Hercules supplied to Turkey and the small, extremely short-range tactical system, Rapier, which Britain at one time sold to Libya. This type of presentation is thoroughly confusing to the average reader who will not have a detailed knowledge of weapons systems specifications. There are other minor inconsistencies in this table. Though Libya is listed as a recipient of Rapier in the arms trade register on page 253, it is not included as a recipient on the chart on page 47. In the same chart, Australia is listed as a "Third World country" but Japan is not. Two pages earlier, in a footnote, Australia is explicitly excluded from the definition of a "developing country."

Another chart on page 48 lists "the spread of supersonic aircraft among Third World countries." Included in SIPRI's definition of "supersonic" aircraft are the A-4 Skyhawk, the Mystère IV A, the Vautour II, the Buccaneer, and the G-91. However, none of these aircraft can achieve speeds of Mach 1.0 in level flight—the normal definition of a supersonic aircraft. As a consequence, the dramatic impact of the chart, which suggests an exponential growth in transfers of "supersonic aircraft," is misleading to say the least.

Aside from such irritating little mistakes, the most serious criticism of the 1968/69 *Yearbook* relates to those aspects of the world military environment which the authors do not discuss in any depth or any detail. There is, for instance, almost no analysis of the Soviet and

Chinese military budgets and the respective military programs that stem from them. Instead the authors argue that because most of the data on strategic matters come from U.S. sources, examples of technical developments in the arms race have to be American. As a consequence, Chapter Two on "The Technological Arms Race" is devoted to a discussion of American rather than Soviet, British, or French weapons development. The result is an implicit but probably unintentional bias to the effect that the United States is the prime instigator of the arms race. The chapter that analyzes world military expenditures is also a little disappointing. The treatment of the U.S. defense budget is very sketchy: it compares unfavorably with the annual posture statements put out by the U.S. Secretary of Defense and pales in comparison to the rigorous analysis made by William Kaufmann in the recent Brookings Institution study of the 1971 U.S. Budget (Charles L. Schultze with Edward K. Hamilton and Allen Schick, *Setting National Priorities: The 1971 Budget*).

The reluctance on the part of SIPRI researchers to attempt an analysis, however incomplete, of the Soviet and Chinese budgets and to hazard a guess at some of the inelasticities and constraints in the Soviet and Chinese defense planning process may have been for sound scholarly reasons. After all, there is little hard data about the Soviet Union and China. Nevertheless, I cannot help feeling that SIPRI has taken the easy way out and in future should aim for a more balanced approach when presenting the mechanics of the superpower arms race. The fact that the United States is so free with information and the Russians and Chinese, and to some extent the British and the French, are so tight is in itself an important observation that may shed some light on one of the causes of the central arms race.

This is not to suggest that SIPRI, in this reference publication, should become involved in a debate on the origins of the Cold War. The purpose of the *Yearbook* should be to present the raw material of the arms race without any normative bias. But for precisely this reason SIPRI should get out of its way

to present whatever Soviet and Chinese data are available.

There is enough that is good about the *Yearbook* to more than offset these criticisms. However, given the importance of having access to value-free data on U.S., Soviet, and Chinese strategic relations, it would be a pity if this section of the *Yearbook* became a watered-down synthesis of U.S. Department of Defense and congressional publications. One hopes that it will not and that the second edition, due to be published this fall, will make amends.

This review was prepared by Mr. Kemp in May, 1970, and its publication in Technology Review was delayed by factors beyond the reviewer's control. Mr. Kemp notes that publication of the 1969/70 edition of the Yearbook of World Armaments is now imminent, and he stresses that his comments concerning the 1968/69 edition should not be taken to pertain to the newer book when it appears.—Ed.

A Generous Enough-ness

Atomic Shield, 1947-1952, Volume II of a History of the United States Atomic Energy Commission
Richard G. Hewlett and Francis Duncan
University Park, Pennsylvania State University Press, 1970, 593 pp., \$11.95

Reviewed by
Victor K. McElheny
Science Editor, *Boston Globe*

On April 3, 1947, just before the first five members of the U.S. Atomic Energy Commission weathered a bruising Senate fight over their confirmation, they had the uncomfortable duty of showing President Truman a memo that said, "The present supply of atomic bombs is very small. The actual number for which all necessary parts are available is . . ."

When Truman paused on reaching the blanks, Hewlett and Duncan relate, A.E.C. Chairman David Lilienthal, who had made his reputation as chief of the Tennessee Valley Authority and who had hoped to emphasize the peaceful uses of the atom once its control had been shifted from military to civilian hands,

supplied the pitifully small number. Hewlett and Duncan record that "the shock was apparent on Truman's face. He went on reading: 'None of the bombs is assembled. The highly technical operation of assembly hitherto has been effected by civilian teams no longer organized as such. Training of military personnel to effect assembly is not yet complete.'"

This incident makes clear something which few people realize: that there was little reality to the American "nuclear monopoly" during the four brief years it lasted—from the test explosion over Alamogordo, New Mexico, July 16, 1945, to the detonation of the first Soviet device August 29, 1949.

During most of that period, the U.S. was making very crude bombs and few of them. First-rate scientists had fled Los Alamos, the weapons development center. There was little work on thermonuclear weapons, known to be a theoretical possibility for years. Reactors for producing plutonium from natural ura-

nium at Hanford, Wash., were plagued by swelling of their graphite moderator and bending of their fuel elements. They were expected to shut down gradually of themselves. A wasteful reprocessing technique was losing quantities of valuable uranium when "spent" fuel elements were withdrawn and dissolved to recover plutonium. Although the gaseous diffusion cascades at Oak Ridge were working well at their task of isolating uranium-235, there had been little development of bombs to use it. Uranium ore supplies in the Belgian Congo, shared equally with Britain, were being exhausted at a rapid rate.

Hampered as it is by the acknowledged need to keep secret much of the history of the decision to develop a thermonuclear bomb, Hewlett and Duncan's second volume of the A.E.C. official history is an important antidote to the so-called revisionist historians' view. The latter holds that use of the atomic bomb against Hiroshima and Nagasaki was not the last act in a traditional World War II

bombing campaign, but rather the first step in a cold war in which U.S. officials, following a supposedly clear-eyed view of vast imperial responsibilities newly seized from Britain, were determined to end the war fast so that Russia could not share in the occupation of Japan.

The view from the Atomic Energy Commission of the Washington policy making of those years is very different. It reveals a picture of some muddle, some hysteria, but above all an ever-growing anxiety to meet what was conceived as a total threat from an expansionist Soviet Union. The dominant mood is one of continued pressure to respond to initiatives taken elsewhere, not of pursuit of some conscious imperial plan.

As has happened so often before and since, the American response was excessive to the point of mania. There was a massive expansion of the U.S. nuclear materials production, a hell-for-leather development that might best be called "the birth of overkill."

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(COMPUTER DECISION, August, 1970)

Existing reactors at Hanford were repaired. New reprocessing techniques bore fruit in a vast new plant that husbanded scarce uranium. More reactors were started at Hanford. Still more reactors were started at a vast new Hanford in South Carolina. Many new cascades were added at Oak Ridge. A new gaseous diffusion plant was started at Paducah, Ky., and when that was deemed insufficient, yet another new plant was approved for Portsmouth, O. Purchases of ore abroad rose, and a feverish uranium exploration effort spread over several mountain states.

Fissionable material for bombs began to be produced in such quantity that one can estimate that until operation of the reactors and gaseous diffusion plants was drastically curtailed in 1964, enough material to fuel the entire projected civilian nuclear power program of the U.S. up to the year 2000 was produced and promptly locked up in bombs.

Thermonuclear bombs, even when borne by bombers in the mid-1950's, had the capacity to inflict many times the damage the Soviet Union suffered during World War II—a level of damage well beyond the level sufficient to deter Stalin, let alone his more moderate successors. The bombs contained so much fissionable material that it has apparently been possible for a decade to run most of the U.S. intercontinental missile program—which involves more numerous, but smaller and more sophisticated warheads—by cannibalizing the older weapons.

A prime mover behind the multibillion-dollar expansion, which dwarfed the all-out drive of the Manhattan Project, was a chief architect of the legislation creating the A.E.C., Senator Brien McMahon of Connecticut. He was unmoved by the arguments of J. Robert Oppenheimer and many others that a thermonuclear bomb could confer only additional danger. McMahon held, passionately, that Russia represented total evil, that it was better to be bankrupt than defenseless, and that there never could be enough atomic bombs. Hewlett and Duncan time and again record the views of this intensely-dedicated, now-forgotten public figure.

McMahon emerges as a classic figure of the nearly-hysterical times that the U.S. passed through during the crises of Czechoslovakia, Berlin, China, Korea, the atomic spy cases and the explosion of Soviet nuclear devices. It is difficult to recapture mentally today that climate of fear in which uncritical enthusiasts like McMahon and Edward Teller had the running. Such obstacles as repeated calls for the U.S. to assess how many atomic bombs it needed were swept aside. It is clear from Hewlett and Duncan's inevitably dry and bureaucratic book that, throughout the period of 1947 to 1952, the U.S. military made virtually no effort to integrate the atomic bomb into its strategic or tactical thinking and hence were completely unable to supply a coherent estimate of their needs for nuclear

weapons despite repeated vain inquiries by the A.E.C., which was seeking to fulfill its responsibility to make the principle of civilian control operate in practice. The A.E.C. said that its role went beyond that of mere supplier or custodian. But the military constantly cried, "More!" and repeatedly reached for custody of the bombs.

McMahon's role in pushing for expansion of the A.E.C.'s production is less well known but just as central as his pressure on the A.E.C. and Truman to set aside the 1949 report of the A.E.C. General Advisory Committee recommending against construction of a thermonuclear bomb and for a public renunciation of such a weapon.

There had to be a halt, and finally there was one. Early in 1952, Truman approved a final expansion which, although enormous, fell far short of what McMahon wanted. Truman apparently sensed the importance of the occasion, for on January 16, 1952, he told a meeting of high officials that the issue of expansion was one of the most significant to come before him—this from the man who unleashed the atomic bomb on Japan and gave the green light to the H-bomb.

Fortunately for all of us, President Truman's definition of "enough-ness" was so generous that even the Defense Department did not feel able to challenge it.

Hewlett and Duncan's rather flat account arouses the polemical thought that "doves" in today's Congress should push much harder for the destruction of bombers and land-based missiles so that their nuclear material can be diverted to power plants.

Frederick Law Olmsted in the last century and Paolo Soleri in this are united by a shared passion both to naturalize and civilize man's artificial landscape, the city. Both proceed from the criticism of existing urban environments to the creation of new patterns, and both proceed from prophetic vision to real-world accomplishment. Two recent books present, in text and illustration, their voice and vision.

Civilizing American Cities:

A Selection of Frederick Law Olmsted's Writings on City Landscapes
edited by S. B. Sutton

A century ago Frederick Law Olmsted recognized the need for extensive planning if American cities were to become civilized environments for man. The selections in this book demonstrate his understanding of urban spaces and how, when politically unobstructed, he was able to manipulate them. While Miss Sutton has concentrated on Olmsted's contributions to the theory and practice of city planning, her anthology reveals a broad and comprehensive cross-section of his career.

Writings in the first two chapters elucidate the views and values that Olmsted brought to his work and his criticisms of existing urban patterns.

The book's remaining chapters contain documents written in support of specific plans for five North American cities with widely varying conditions: San Francisco, Buffalo, Montreal, Chicago, and Boston. The writings range in scope from Olmsted's observations on 19th century California life to his most elaborate and ambitious design of a system of parks and boulevards for Boston.

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— Los Angeles Times

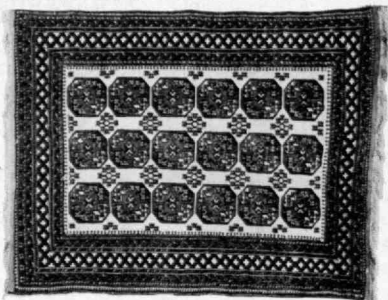
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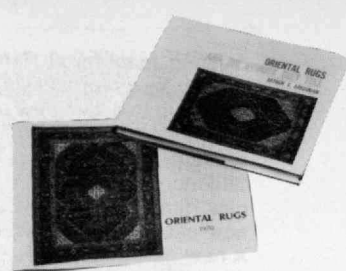
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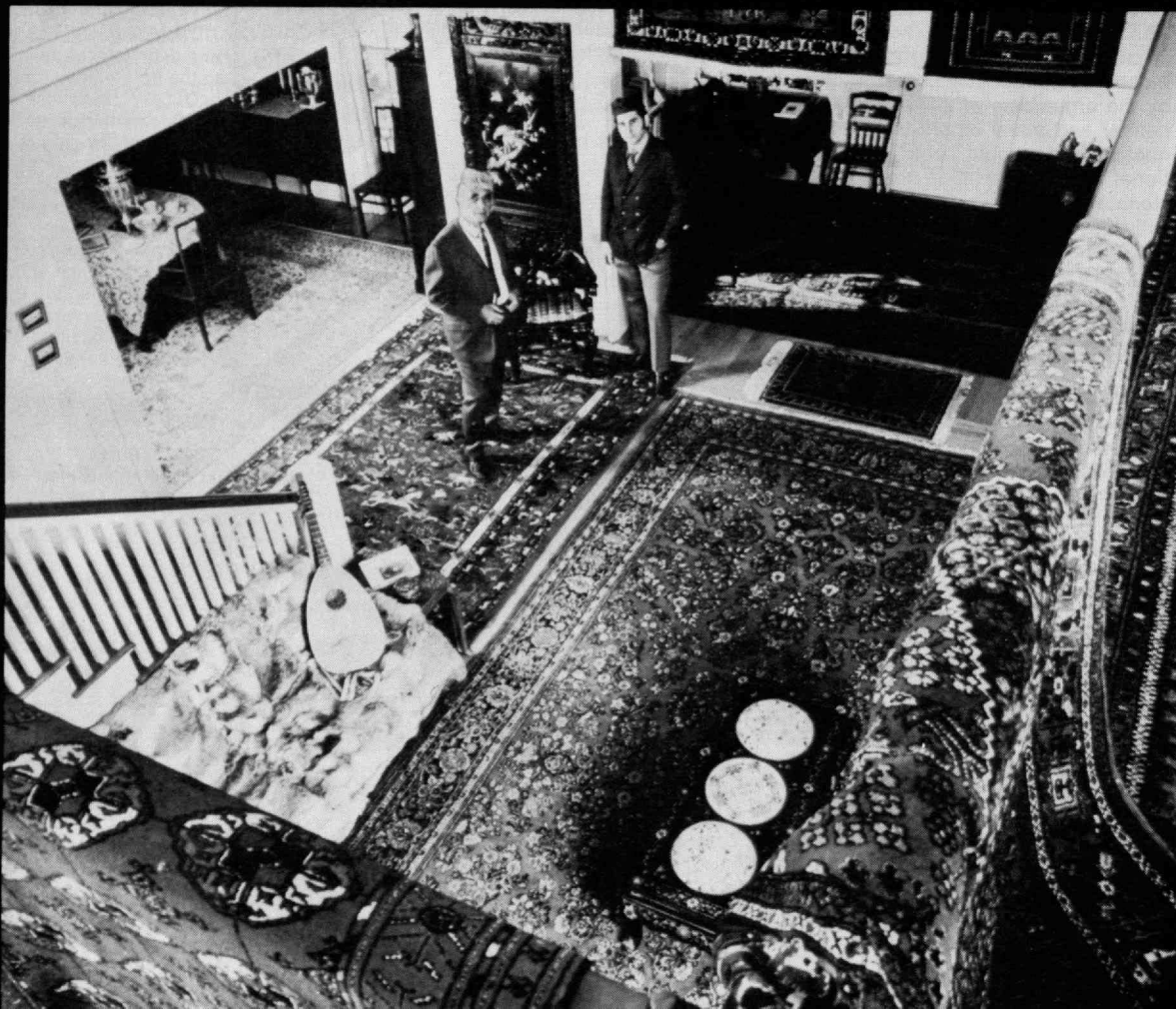


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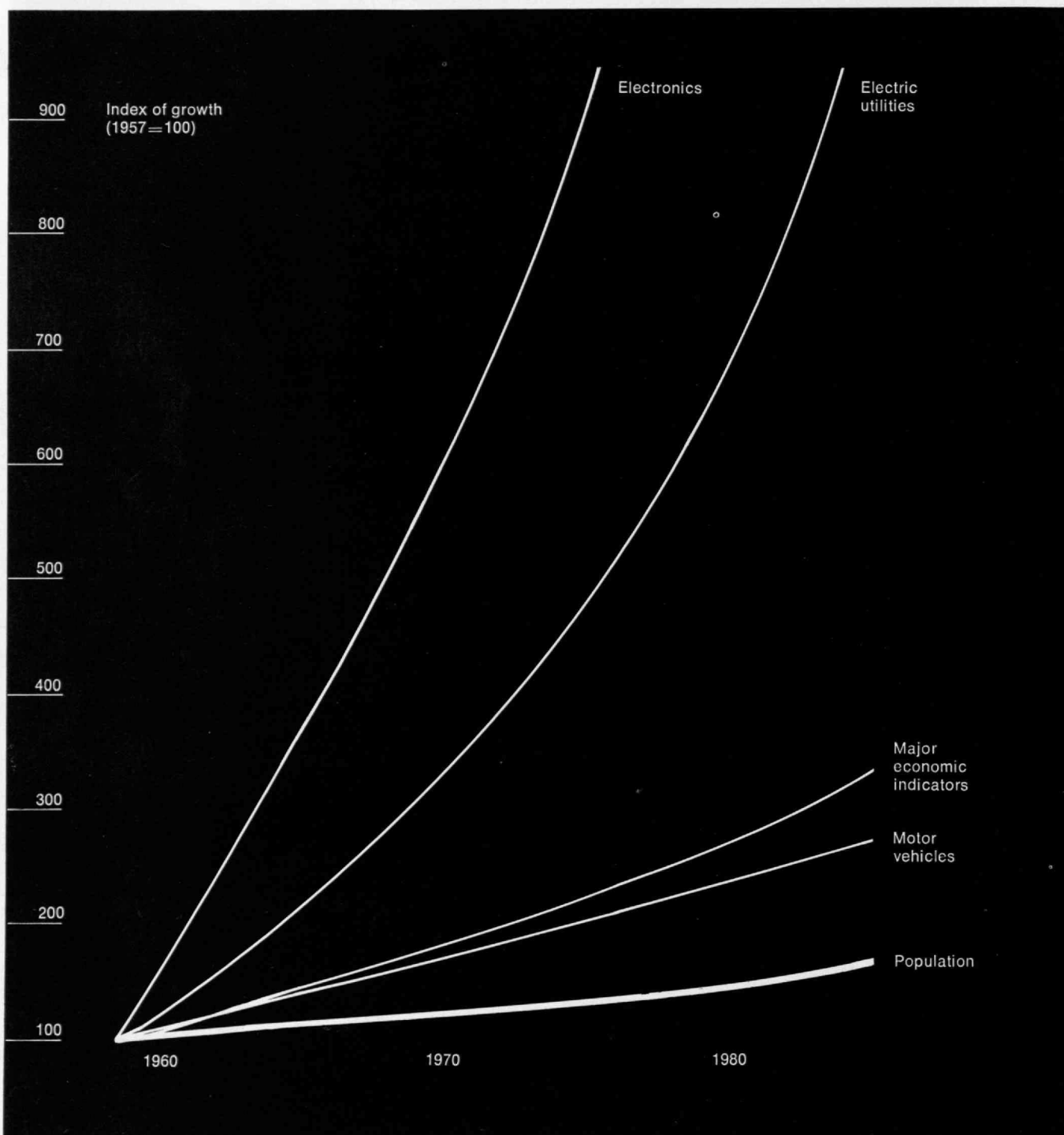
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In an era when social problems and the issue of environmental integrity have finally achieved urgency, its traditions of noninvolvement and aloofness may be the university's own worst enemy

Gordon S. Brown
Dugald C. Jackson Professor of
Engineering, M.I.T.

Can Universities Fulfill the Challenge of Relevance?

Three truisms expose the great challenge which is today before educators—especially those in schools of engineering.

Never since the dawn of the industrial era has a machine, device, system, or institution been invented which has not been called upon, within a relatively short time, to perform at a higher degree of capability than its designers built into it. Consider, for instance, the wheel, the plow, the aeroplane, the automobile, the banking system, the university, the industrial corporation, the government, the city, even the U.S. Constitution.

Most educators will admit, at least privately, that year after year one or two of their students see interpretations of their teaching more clearly and with longer-range significance than they do. When I was teaching feedback control systems, for example, some student every year made an original contribution that I had not foreseen. I well remember how clearly Jay W. Forrester, at age 30, when working with me in the Servomechanism Laboratory, saw the potential for high-speed digital data processing and the importance of high-speed reliable magnetic-core memory. He certainly saw it more clearly than many oldsters in Washington who, about 1950, made the remark that they could see no conceivable use for the Whirlwind computer. (Whirlwind, as built by Forrester and his colleagues, is still in use today.)

Many of the problems with which we cope today had their origins in decisions made in government, industry, and education a decade ago. There were voices in protest, admittedly weak—many from the young. Clearly we did not understand the situation. Let's not repeat the practice.

The Responsibilities of Universities

No detailed recital of man's current problems is necessary. We are concerned over the war in Vietnam and the conflict in the Middle East; with poverty here at home, in Africa, in India, and in the whole of Southeast Asia; with the worldwide tensions; with the ghettos everywhere; with the widespread increase in crime, the breakdown in our value system, and our inability to give service and maintain the stability of our social system. The crisis on many fronts has explosive tendencies.

What relation do universities have to these problems? Do they not fulfill their mission by pursuing scholarship

with great vigor, by establishing great libraries, by making it possible for youth to enter their halls to learn as accurately as possible what man has done and how he got to where he is now?

Many believe they do not. The fulfillment of only this mission is held to be merely looking backward and inward, merely being a custodian of the present state of knowledge. They say that the university must not be merely a custodian but also a dynamic critic and an instigator of change. They believe that among all institutions in society the university has the greatest responsibility to be a shaper of society, that it has an obligation to identify social wrongs and take aggressive action, to lead and rectify them. This argument was made by Victor F. Weisskopf and Gregory Smith in their statement on "Public Policy, Public Opinion and the University" in the report of the Review Panel of the Special Laboratories at M.I.T. a year ago:

"For centuries the university has been to many, to use the cliché, 'The Ivory Tower.' By that we mean it has not involved itself in 'mission work' to a large degree, but rather has been the storehouse and dispenser of knowledge.

"It has delivered learning to its students in the classical way; it has not as an instrument involved itself in specific problems of society.

"Government, on the other hand, exists largely to find solutions to problems. They are indeed its *raison d'être*.

"In the past, the universities have educated. The governments have acted. This complete division is no longer appropriate. Civilization has become so complex and its problems so enormous that the universities must be willing to a considerable extent to take on missions. There is simply not time to give out basic research data and hope it will be intelligently applied. The university must assume a portion of the leadership in directing itself to specific problems."

I endorse this view. It says that universities must play an active public service role—a role that today calls for involvement in the solution of societal problems even to an extent that produces strain within its internal structure. It is as Howard W. Johnson said in his inaugural address as President of M.I.T.: "The demands upon the

university of today to meet the problems of the new world alter the ways which it performs to fill its basic functions."

The University and Public Service

The public service role of universities is an issue on which there is not unanimous agreement. Many do not believe in it. Many others do. The former believe that the university should remain aloof from public service involvement on the grounds that such action is inconsistent with an academic institution's basic responsibilities for teaching and the discovery of new knowledge, and that this position is essential to protect its integrity. The situation may be described by the prayer—"Lord, use me in Thy service, but only in an advisory capacity." The latter—those who do believe in public service—say that among all institutions in society the university has the greatest responsibility to be a shaper of society, that it has an obligation to identify social wrongs and take aggressive action, to lead and rectify them.

This issue was the central theme of discussion at the 61st annual meeting of the Carnegie Foundation for the Advancement of Teaching, which is summarized in an essay titled "The University at the Service of Society" in the Foundation's 1966-1967 Annual Report. It is stimulating and provocative reading.

It defines public service "as the outreach of a university to society at large, with extending the resources of the campus to individuals and groups who are not part of the regular academic community, and with bringing an academic institution's special competence to bear on the solution of society's problems. Public service can take place on or off campus, and can be related to either the governmental or private sectors of our national life. It can involve all members of the academic community.

"Pressure is exerted much more heavily than in the past on the university's traditional areas of responsibility—the production of highly trained manpower and the discovery of new knowledge. Beyond these functions, the university is being asked today to take on many kinds of new public service tasks, including the management of large-scale scientific, technological, and social enterprises. [Indeed,] the university's . . . achievements generally in all three areas—teaching, research, and service—have been so centrally important as to lead some observers to believe that the society's fu-

ture salvation will depend essentially on this institution alone. The immensity of such a responsibility and the almost limitless performance expected of the university are cause for deep concern among those who manage its affairs."

Engineering educators have a special role in this discussion. We glibly say that the role of the engineer is to exploit science for the benefit of mankind. Rarely do we say that an engineer at work—doing engineering—is practicing the art of the deliberate and organized forcing of not only technological change but political, social, and economic change. Yet I am convinced that if the role of the engineer, and the way in which his work is related to social issues—the engineer's impact on society—do not change rapidly, the consequences for mankind in the next two decades may be catastrophic.

I focus on the engineer not because I hold him responsible for the wrongs in our society but because I believe that his skills, his attitudes, and the role he is expected to play qualify him uniquely for expanded responsibilities in the next decades.

But to fulfill these responsibilities his education—and the institutions which provide it—must change. This is my central message.

Just what are these changes, what must he be prepared for? What are the issues which now press upon us? The list is familiar: the population explosion; the squandering of natural resources; the poisoning of the environment; our poorly ordered list of priorities: we seem overly concerned with increasing the standard of living, which, to the casual observer, means more gadgets, more autos, more refrigerators, more TV sets. We are not properly concerned about the real goal, the higher quality of life for all mankind.

These questions are brought together in the following excerpts from a statement released by the Board of the Rockefeller Foundation explaining their vote on the issues before the annual meeting of General Motors Corporation last spring: "The trustees of the Rockefeller Foundation believe with the organizers of Campaign G.M. that the corporations of America must assert an unprecedented order of leadership in helping to solve the social problems of our time. We realize that for corporations to exercise this leadership they must continue

to prosper and to grow and to be profitable investments to their stockholders. But to stop there is to stop short of the the moral and civic response required of the leaders of industry by the present crisis in our social order. There are battles to be waged against racism, poverty, pollution and urban blight, which the government alone cannot win; they can be won only if the status and power of American corporate industry are fully and effectively committed to the struggle. What is needed from business today is leadership which is courageous, wise and compassionate, which is enlightened in its own and the public's interest, and which greets change with an open mind. . . .

"The concerns expressed by Campaign G.M. represent far more than the aspirations of one group of private citizens and indeed go beyond the demand of the American consumer for safer, healthier and more durable products at reasonable cost. They are clearly pointed in the direction in which General Motors and every American corporation must move if they are to function effectively and responsibly in the difficult years ahead."

In the past, concern for issues such as these was considered by many to be outside the realm of engineering—certainly outside the realm of engineering education. But tomorrow our graduates, as the future leaders of our corporations, will be involved in all of them.

The Work Function of Engineers

Engineers in their creative work bring together a lot of knowledge which offhand seems unrelated. As they build useful structures, machines, and systems that mankind needs, can use, and can afford to buy, they integrate this knowledge, organize it, and shape it. They should always be seeking ways to weave this knowledge and these machines and systems in a benign manner into the whole fabric of the new society.

Engineers are the primary creators of wealth. Indeed, because of their work we may say that we live in a man-made world. They hold the key to the amelioration of the problems of urban decay, population explosion, food shortage, and the social unrest that develops wherever people realize that others in the world enjoy greater economic stability and higher living standards than they do. As Karl T. Compton once said, "The skills of engineers offer nations and people the greatest hope for creating

abundance without resorting to the age-old practice of stealing it from others."

During the past 20 years, science and technology have given us a truly remarkable number of developments—nuclear power, satellites and space exploration, jet transport, helicopter service, the pill, color television, direct long-distance dialing, low-calorie food and drink, Polaroid cameras, polio vaccines, antibiotics and pesticides, plastic packaging, office copying, digital computers, and millions of automobiles—to name a few. These developments—and others—have brought with them the frustrations and problems that Campaign G.M., the United Nations, today's college students, and indeed all of us are talking about. And yet the sources from which they stem also hold the power to solve our problems, and among the university's obligations is that of making clear this relevance.

The world of the next generation promises a still vaster complex of new technology—and also new problems—that my generation did not have. For example: Recent work in materials science shows promise of technological breakthroughs in new configurations of matter, new ways to prepare and use materials. Society will face new problems in how to dispose of these materials. Recent advances in computers—both in the electronics and the programs—open up wholly new ways to process information. But too few students realize the political, economic, and social impact of these developments as they will affect—for example—one's privacy, or one's life as a person instead of as a hole in an I.B.M. card.

The availability of orbiting satellites and miniaturized electronics will open up communications by providing thousands of voice circuits and dozens of TV channels between continents so that never again will any society be able to remain completely closed.

There will be new demands for energy as human expectations and the population increase. There must be new energy systems to fulfill them, but can we in fact double the present installed generating capacity in the next decade, and double it all again in the following decade as has been our record of the past?

Engineering developments in food processing and food storage and new sources of protein are essential if mankind is to be assured of an adequate protein diet,

"It is sensitive and flexible judgment that alone can proceed to a solution. The judgment must not be bound by precedent nor over-enchanted by the new. It must be that of the liberal and mature mind, where the present has no priority over the past or future. And it must be tempered and governed by a new and/or better set of over-viewing mechanisms, which must exist as a continuum." (Photo: Gjon Mili)



and not merely empty calories. Whole cities must be rebuilt, and our concern must be with the totality of how man lives and how he makes a living. Society demands better health care at reduced cost, and—again—the problems are as much people problems as technical problems, for closely linked to these issues is the awesome threat of the population explosion. Vigorous engineering effort in the area of disposal of wastes, specifically to ameliorate air, land, and water pollution and urban filth must evolve hand-in-hand with the technologies that cause the pollution.

Few people realize that in many areas of technology Americans junk daily an entire day's production of the country's manufacturing capacity.

Business management experiences enormous pressure for economic expansion at 5 or more per cent per year, regardless of the means. But surely there is some limit to exponential growth.

These few examples indicate the broad range of challenges and responsibilities open to graduates of our engineering schools, whom I regard as this nation's greatest resource for achieving the new society we all seek. Clearly, we face the dilemmas of trade-offs. How do we respond?

Mission-Oriented Interdisciplinary Activity

I answer by saying that there is urgent need for institutions such as M.I.T. to cultivate and interact with dynamic, open-ended, self-generative, interdisciplinary programs with relevance to tomorrow's problems. Students should participate actively in these programs.

For the engineer, this calls for deeper and broader awareness of what our modern society is all about—and this means knowing not only how society reached its present state but what treatments will improve its health. Engineers must know more than mathematics, physics, the applied sciences, and the art of design to produce technology.

We have been saying this for five generations, and in consequence we have required engineering students to include a significant amount of humanities in their educational programs; but still something is lacking.

A doctor who is prescribing drugs is expected to know

about the functions of the whole body, not just about one organ or one limb, so that his treatments will improve the health of the entire system; his studies of the body were not for cultural reasons.

Likewise, the engineer must know about society as best he can so that as he applies science he will be aware of how his works may interact with the political, economic, and social systems to contribute to a higher quality of life—not merely a higher standard of living. Since our systems are all man-made—there need be nothing sacred about them—engineers must be prepared often to deliberately alter social, economic, or political systems.

I doubt that students can be given the necessary working familiarity with these systems merely by the random and remote practice of classroom study. We continue to need, and I applaud, specialization and scholarship in engineering and in the systems through which it is brought to society. But there is a growing need for generalists in the institution to play a visible and active role in presenting the interrelationships of technology and society, and there is a growing need for mission-oriented programs to give authentic and purposeful focus to their activities. If these are to be truly authentic, it is essential that they be involved in world situations beyond the boundaries of the classroom.

Medical education takes this for granted and now is even promoting involvement not only in the clinical hospital but in the world of engineering as it seeks new technology to strengthen its efforts in the diagnosis, prevention, and treatment of disease. Most first-rate architectural schools encourage their professors to practice architecture.

Likewise, engineering schools must encourage their faculties to practice their engineering in the sociopolitical arena as well as in the strictly technological arena. They should work with lawyers, tax experts, and politicians as well as other engineers and scientists to show their students what the real world is actually all about. In selected instances, they should be encouraged to take their students with them into the real-world arena, or to bring some of this activity onto the campus so that the students can engage in it.

The mission-oriented program in which faculty of di-

verse disciplines participate is the only way I know to do this with authenticity. Such a mission-oriented activity is a far cry from the classical laboratory that carries on basic research or the teaching laboratory that embraces only small manifestations of the broad problem. Establishing faculty competence and open-ended education with the broadened view of engineering that I am trying to describe will not happen automatically. Engineering faculty cannot bring about interdisciplinary teaching without the active participation of professionals in the other disciplines. There must be created on the campus a visible focus for their efforts, and that focus must have student participation.

And there is one additional and significant requirement. For the mission-oriented program to be viable in an intellectual environment there must be a central intellectual theme to provide a unifying component that is widely applicable. Only in this way can the mission program attract the significant participation of students and professors with many different interests.

One such central focus which I propose as having both intellectual power and current relevance, for example, is the new conceptual model of the dynamics of complex nonlinear systems—i.e., the urban scene—expounded by Jay W. Forrester at M.I.T. (see *Technology Review for April, 1969*). I believe that Professor Forrester's ideas provide the nucleus for a whole new intellectual discipline around which faculty, students, and professionals can cluster as they attack urban problems. This discipline will lead to professional areas that will be as large in their impact on society as automatic control or medical technology. We need help to build it.

The value of a central intellectual theme to sustain mission-oriented projects was clearly demonstrated, for example, in the early days of the Servomechanism Laboratory at M.I.T., where the intellectual studies and teaching of the author and of the late Professor Campbell in the classroom, and the theses done by students, led to a scholarly understanding of complicated feedback control systems and gave cohesion and open-endedness to parallel work in the laboratory, where a host of development and design projects resulted in specific control and guidance mechanisms. Plasma physics provides another example: when many M.I.T. faculty members were pursuing their interests in the development of thermonuclear power (the mission objec-

tive), the intellectual studies led by Professors William P. Allis, Sanborn C. Brown, Hermann Haus, and others, with their students, to understand the fundamentals that explained the properties and stability of high temperature plasmas provided the unifying theme and the common interest for faculty of diverse disciplines.

Administrative procedures and the traditional departmental organizations of universities are deterrents; the heavy hand of tradition says publish or perish. To establish this new activity requires special resources of time and money, the encouragement to experiment, new groupings of studies, and the courage to free students from requirements that are merely the extrapolation, year after year, of old-fashioned doctrines.

A university is a man-made invention. It must now be reinvented to include doctrines and procedures which enable it to reach beyond the borders of its campus to point the way and help mankind head off disaster. This argues strongly for active university involvement in those projects that can be made to reinforce and strengthen its teaching. By careful planning, mission-oriented projects which permit student participation can be brought to the campus without making the university into an industrial shop. As my colleague Dean Emeritus C. Richard Soderberg has said, "Technological education, in particular, cannot prosper in sterile academic forms. It must feed on life itself, and anything which is significant in the technological activity of our society is worthy of serious study and the most imaginative application of scientific rigor."

The Dilemmas of Relevance

The review of the university in this age is overdue. For too long—indeed, perhaps for centuries—the university has drifted. This does not mean it has not changed. It has indulged in peaceful self-examination, but in no sense has it exhibited an awareness of crisis or urgency to reappraise its purpose. Meanwhile society outside the university has changed at a convulsive rate. There are many reasons for this: wars proliferate, modern weaponry has become increasingly destructive, the environment has been plundered and laid waste, recent knowledge has exploded many myths, a multitude of forces have combined to cause a morphological revolution. But most significant has been the explosion of our communication media. People now quite literally see the poverty of the ghetto, the outbreaks of crime and

violence in cities, the tanks in the city square, man-to-man combat between military forces, the starving Biafran—all in widely scattered areas around the world, often as they occur but always within a few hours of the occurrence.

Our immensely greater awareness of human events has raised the clamor for new relevance, and the loudest and most strident voices have been those of the young. This generation knows—as previous generations have not—the real sores of our society, and today's young people want their education to have more impact on the problems which they see as central to human freedom and equality. The refreshing and exciting quality of our young is that they are not "case hardened," that they are free enough to ask "why" and "why not." For those whose minds are open, these questions can be a refreshing and indeed invaluable stimulus.

But to say that a review of the university is overdue does not say that the university should immediately revolutionize itself. The restraint of the university against deep involvement in public affairs and/or policy is not wholly bad. Political expedience and long-term objectivity are unhappy bedfellows. There must be a reservoir of objectivity and intellectual activity above the "madding crowd."

If the aloofness of the university cannot be as extreme as it has been, it is also true that the changes which it must make cannot be rigidly structured under emotional pressures; such changes, outdated tomorrow, will certainly fail.

It is sensitive, flexible judgment that alone can proceed to a solution. The judgment must not be bound by precedent nor over-enchanted by the new. It must be that of the liberal and mature mind, where the present has no priority over the past or future. And it must be tempered and governed by a new and/or better set of over-viewing mechanisms, which must exist as a continuum.

Gregory Smith, Chairman of the M.I.T. Corporation's Advisory Committee, sees this dilemma of the modern university very clearly. He writes, "The university must not become a political agent; it must not support House Bill XYZ. And yet it must leave to a degree its ivory tower, for it is the highest repository of intellectuality. The path it must tread is dangerous and narrow. And the qualities needed by its leadership are qualities that are not emphasized enough. We speak of intelligence, creativity, integrity. All of these are needed. But equally are needed the qualities of judgment and sensitivity that set the leaders apart and above. We expect them to tread the narrow path. We recognize the dangers of the university invading the social field, but we recognize the greater sorrows if they fail to do so. And so our leadership must have the judgment and sensitivity of now pushing, now checking."

The tendency of many to sell the university short is a grave and present danger. Too often, when alumni and business leaders are asked what they are doing about the support of higher education, they say glibly that the

issue is no longer pertinent, that the universities have simply become ineffectual points of strife and confrontation. This cynical attitude throws out the baby with the bath water. It uses a wide-angle lens when the target calls for a telescope to differentiate between a few hard-core nihilists and many thoughtful activists. The need is for discrimination, and it has never been more urgent.

William Cowper must have had these thoughts in mind, when in 1785, in his poem, "The Task," he wrote,

"Knowledge and Wisdom, far from being one,
Have oftentimes no connexion. Knowledge dwells
In heads replete with thoughts of other men;
Wisdom in minds attentive to their own.
Knowledge, a rude unprofitable mass,
The mere materials with which Wisdom builds,
Till smooth'd, and squared, and fitted to its place
Does but encumber whom it seems to enrich.
Knowledge is proud that he has learned so much;
Wisdom is humble that he knows no more."

As you reflect on these matters, don't be surprised if your conclusion is mine: "We have met the enemy, and he is us."

Gordon S. Brown's career at M.I.T. began when he first came from Australia to join the Class of 1931. The thesis for his Sc.D. degree represented a pioneering contribution to automatic control theory, and he has since been founder and Director of the Servomechanisms Laboratory (to which he refers in this paper), Head of the Department of Electrical Engineering, and Dean of the School of Engineering. He acknowledges suggestions from Gregory Smith, Chairman of the M.I.T. Corporation's Advisory Committee on Institute-Wide Affairs and of Technology Review's Editorial Advisory Board, in the preparation of sections of this paper.

"Most present-day professional training puts far too much emphasis on individual project and thesis work. Students do not learn the attitudes and skills which go with team effort, and when they later find themselves having to collaborate on practical problems with practitioners from other professions they often lack both the inclination and the ability to do so."



The proper role of the professional is changing: he must now be not only his client's specialist but society's ombudsman. What new conflicts will he encounter, and how can he be prepared for this new task as advocate?

Edgar H. Schein
Sloan School of Management, M.I.T.

The Role Innovator and His Education

Because of the increasing rate of social and technological change, many professions have found themselves increasingly under strain. The complex social problems of a rapidly changing society seem not to be amenable to traditional solutions. Faced with such phenomena as the increasing use of drugs, urban decay, racial tensions, a world armament race, and intergenerational conflicts, the doctor, psychiatrist, social worker, lawyer, architect, professor, and other professionals find that their professional education has ill prepared them for such a world.

It is not so much that they lack scientific or technological training. It is that they are uncertain of their proper roles. For example—perhaps the simplest case—should the architect simply fulfill the wishes of the client who can provide the usual fee for his services? Or should he try to do something for those who dwell in the degrading world of slums and “projects” because they can afford nothing better?

Three Types of Professional Career

Not all professionals feel this kind of dilemma so keenly. A profession contains, I think, three basically different types of people who pursue three different kinds of professional career, which I call custodianship, content innovation, and role innovation. All have their uses, but it is becoming increasingly important that there should be enough of the third kind of professionals, and that they should be properly educated.

Custodianship—This type of career is characterized by total acceptance of the currently existing norms of the profession and by basic acceptance of the current levels of knowledge and skill in that profession. The custodian is a man who is content to use his technical training in the performance of a traditionally defined role; he works hard at maintaining present professional norms; he accepts whatever licensing procedures may exist. He tends to favor the development of strong professional associations ruled essentially by elected colleagues.

Content Innovation—This type of career is characterized by acceptance of the traditional norms of the profession pertaining to practice, but dissatisfaction with the existing levels of knowledge and skill. Thus the content innovator will concentrate on science, technology, or scholarship to improve the knowledge base and equip-

ment upon which the profession depends. Often he will be, rather than a direct practitioner, a professor in a professional school or in a university department related to a profession (as, for example, microbiology is related to medicine). The content innovator will be oriented more to academic standards and associations of scholars or scientists, and relatively indifferent to professional associations (unless their norms make it difficult to apply the knowledge he generates so as to upgrade standards or practice, in which case he will be hostile to such norms); he will view licensing procedures as conservative forces which make entry into the profession needlessly difficult for the practitioner trained in the most modern manner. He will assume that the best kind of service that can be rendered to his profession will be to give its practitioner the most current knowledge and skill-training; and he will be less concerned about the ends to which such knowledge and training are put, or what values the practitioner learns.

Role Innovation—This type of career is hardest to describe, because of its relative rarity and the tendency to confuse it with content innovation. The essence of role innovation is a rejection of some of the norms which govern the *practice* of the profession, combined with an interest in elucidating the true or ideal role of the professional in society. The role innovator questions the traditional ideas as to who is a legitimate client; who can or should initiate the contact between client and practitioner; what constitutes an appropriate setting for conducting professional activities; and what are the legitimate boundaries of the professional's area of expertise. Underlying each of these questions is a conviction that the profession could be better geared to the major tasks of society.

Let me illustrate from the professions of psychiatry, law, and architecture. In psychiatry, a dramatic role innovation occurred when a number of military psychiatrists decided to move to the front lines and to involve entire patrols in group discussions, rather than talking only to individuals who exhibited specific symptoms. Furthermore, they did this on their own initiative rather than waiting for a referral from some other source, and they involved themselves as much in the sociology of the combat zone as in the mental health of individual soldiers.

In the legal profession perhaps the best example of a

role innovator is Ralph Nader, with his concern that the law should become an instrument of constructive social change, that the consumer or purchaser of any kind of product should be regarded as a client (even though he may never have thought of going to a lawyer over an automobile safety issue), that legal aid should be as available to the poor, powerless individual as to the rich, powerful corporation, and that legal training should put much more emphasis on questions of value than it has traditionally done.

In architecture, many young professionals coming out of school today face the dilemma of whether they should consider only the values of the client who hires them (for example, the real estate developer) or whether they should pay more attention to the real needs of the actual user of the building (for example, the low-income black family.) The latter possibility lifts the design task out of the comfortable realm of economic and functional specifications, and confronts the architect with new questions. Does the poor black family wish to live like a middle class white family? If economic resources are scarce, how does one choose between the marginal utility of an extra 5 per cent of safety and the marginal utility of more buildings for the poor? Recent architecture graduates are even beginning to question the relevance of an apprenticeship period preceding licensing examinations, and are looking for states in which they can practice without a license.

We can find, in every major profession, practitioners who wish to conduct their practice in a drastically different manner. Although such individuals are not usually content innovators, the new areas of practice which they define may then stimulate the development of new knowledge and techniques: medical sociology; environmental, consumer, and poverty law; and environmental psychology or "socio-physical design."

The interactions between role innovation and content innovation cannot be examined in detail here. Suffice it to say that one can find examples of influence in both directions. Scientific breakthroughs or the development of new technologies create possibilities for new fields of action (and even, sometimes, new professions). Role innovators, exploring tasks that have not previously been considered appropriate, uncover new areas of knowledge and stimulate discovery and technical innovation. Which way the influences mainly flow depends on

whether the profession builds on an established body of generally applicable knowledge (as does civil engineering) or whether it works in a more ad hoc, empirical fashion (the social sciences.)

What Motivates Role Changes?

The custodian or the content innovator must wonder, as the meetings of his society grow more turbulent and as issues are raised which never used to seem relevant to the specialities of his discipline, how role innovation arises in a profession. We can identify three sources, not mutually exclusive or independent of each other, but logically distinct. First, changes in the outside world may create new problems which must be solved—new diseases are discovered or unsolved social problems are identified. For example, large urban centers breed customs, attitudes, predicaments, and personalities which do not mesh with the traditional forms of law, architecture, social service, and health care; educationally disadvantaged groups such as blacks are pinpointed as targets for new forms of education, training, counseling, and management. There is a kind of "role suction"—custodially minded practitioners may find themselves being pulled in new directions by the gravity of the problems with which society confronts them. The doctor who works in the ghetto community health center cannot ignore the origins of the illnesses he treats, or the obstacles facing his patients in their daily lives, and he becomes part social worker, part community sociologist, and part politician, in addition to his traditional medical role.

Second, some professionals have mental predispositions or value systems which are to some degree out of line with the role demands of their job. Such individuals will begin to redefine the job to suit their personal style, and in that process create new ways of doing that job. These are often people with a creative "turn of mind." Those of them who either lack the talent for content innovation or who are blocked from content innovation by conservative professional norms may begin to redefine professional practice, in the quest for congruence between their style and their occupation. Alternatively, the role innovator may be a person whose values—while coinciding with the fundamental values of the profession (as, a psychiatrist who believes that no one should practice without an M.D.)—conflict with certain peripheral norms: for instance, the notion that the patient must always take the initiative in coming to the

psychiatrist or that psychiatrists should not reveal their own personal feelings in the context of a therapeutic relationship. Of course, if such a person also rejected the pivotal norms of the profession, he would no longer be a part of that profession. The role innovator retains his membership in the profession, but stretches the concept of what is legitimate professional practice.

Third, role innovation can be stimulated by professional school training which is deliberately aimed at changing the profession. Some schools attempt to teach their students the present concepts of how the profession should be practiced; others attempt to predict what the profession of the future will have to know and be able to do, and try deliberately to train in terms of that future concept. To the extent that such schools are successful they are producing graduates who, going out into the real world (which includes the American Medical Association), will find it difficult to sustain their acquired values in the face of some of the norms of their profession. To retain their integrity they require early career routes which support their innovative values. Thus young law graduates must have opportunities such as that of joining "Nader's Raiders," and young psychiatrists must have opportunities to work in creative settings such as the Neuropsychiatry Division of the Walter Reed Army Institute of Research.

Let me now pull together some of the above points by focusing on some of the conditions which one must obtain during the education and early career of the professional, if he is to become a role innovator.

Education for Role Innovation

I am assuming that in most professions there are powerful forces which encourage a custodial career orientation. This is especially true in professions like teaching, management, and engineering which are pursued in large bureaucratically organized settings rather than through private practice or small professional offices. In order to counteract these forces, it is necessary for the professional school to stimulate in its students the development of a strongly held value system. In addition, it is necessary for the profession itself to encourage, or at least tolerate, early career paths which may deviate in varying degrees from the traditional ones. The profession and its schools will jointly have to create "half-way houses," in which the young practitioner can become exposed to some of the major social problems facing the profession without being so overwhelmed by them that he falls back on the "tried and true" and, in sheer panic, develops a safe custodial manner (like the physicians who "murmured, as they took their fees, 'There is no cure for this disease'.")

The professional school faculty must be oriented towards research rather than being anchored in current professional practice. In other words, the professional school should avoid hiring too many successful practitioners, (because of the likelihood that they will be custodially oriented) and concentrate instead on hiring scholars, researchers, and role innovators. If too many of the teachers are successful practitioners, they will simply perpetuate the existing norms which govern the practice of that profession—especially since the suc-

cessful practitioner will be the more seductive teacher. Howard S. Becker and his co-authors, in *Boys in White: Student Culture in Medical School* (University of Chicago, 1961), show that if medical students have a choice between listening to the research microbiologist and the successful internist, they will always pay attention to the latter, even though this may seriously restrict their professional education.

The faculty must be interdisciplinary, even if professional practice rests on only one or two fields. In particular, they should include the behavioral sciences and the humanities in order to stimulate intensive analysis of value issues, of humanistic questions, and of the role of their profession in society. Admittedly it is difficult for students to integrate these various points of view during their time in school, but it is my contention that a premature integration can be genuinely harmful in a rapidly changing society. The student does not know what demands will be put upon him five to ten years hence when he is a practitioner. The broader the base of knowledge he is operating from, the better equipped he will be to cope with changing demands. The greater his understanding of value issues and the human consequences of professional practice, the better he will be able to deal with new and as yet unanticipated social problems.

The professional school curriculum must be organized in such a manner that the student obtains frequent opportunities to engage in realistic projects which force him to make intellectual and personal commitments, and in which he obtains immediate and relevant feedback on the consequences of these commitments. I believe strongly that self-knowledge and self-confidence are key requisites for successful role innovation, and that the only way to build such knowledge and confidence is to provide opportunities for such personal involvement.

Preparation for Reality

The curriculum must train the student in the ability to diagnose complex social systems. All professions are beginning to realize the error of viewing the client and the practitioner in isolation from the social systems in which they are enmeshed. The potential role innovator must begin to think in terms of "client systems"—organizations, groups, populations, of people with a common interest. He must know about the probable secondary and long-term effects of his actions, taking into account the entire nexus which surrounds his client.

"Many young professionals coming out of (architecture) school today face the dilemma of whether they should consider only the values of the client who hires them or whether they should pay more attention to the real needs of the actual user of the building. . . . The latter possibility lifts the design task out of the comfortable realm of economic and functional specifications and confronts the architect with new questions."



The Failure and Promise of the Social Sciences

The curriculum must train the student in the uses of social science, which can enable him to understand his interventions in social systems and to initiate processes of constructive change. For example, it is becoming clear that the provision of health care, legal aid, and housing in the urban ghetto is as much a matter of initiating change in the social system of the city as it is a technical task in medicine, law, or architecture. The practitioner who wants to take on such tasks must have skills in *applied* behavioral science along with his other professional skills if he is to do any real good. The kind of training that is needed is exemplified by the Case-Western Reserve Medical School practice of having every medical school student work with an entire family during his school years.

The curriculum must create opportunities to learn to work in a team. As society becomes more complex, one can see increasingly that social problems should be attacked by teams of professionals who come from different disciplines. Most present-day professional training puts far too much emphasis on individual project and thesis work. Students do not learn the attitudes and skills which go with team effort, and when they later find themselves having to collaborate on practical problems with practitioners from other professions they often lack both the inclination and the ability to do so.

The professional school must help to manage the early careers of its graduates to insure that the values and skills which are nurtured during school are brought to real maturity. I have already mentioned professional half-way houses, settings where real clients and real problems can be faced under the tutelage of members of the professional school. Internship and residence in a University Teaching Hospital is a traditional half-way house, but new ones are needed. Community health centers or legal aid centers partly staffed by professors from the nearby medical or law school would be another example. If it is not possible to develop special settings, the professional school should develop a program of continuing education whereby the graduate returns to school at intervals to discuss and review his experiences, to be brought up to date on new developments, and to reinforce the norms and values of the school. If this is too difficult, it would still be possible to organize alumni activities regionally in such a way that standards are revitalized and reaffirmed through continued contact with fellow graduates and visitors from the school.

The psychological contract between students and school should not be terminated at graduation. The school should think of itself as having a longer-range responsibility to its graduates, this responsibility to be discharged in a variety of ways: More active help from the faculty in locating jobs which will permit role-innovative activities; periodic coaching and counseling help from the faculty as graduates need it and call for it during their early career; more involvement of the faculty with professional associations and large organizations in which their graduates work, so that the schools can begin to influence the world in which their graduates work as well as the graduates themselves; more attention to professional licensing procedures, to insure that graduates are not compelled to unlearn some of the very things which they learned in professional school.

Finally, the kind of professional education for role innovation which I have tried to describe will, of course, require professors who are themselves motivated to be role innovators vis-a-vis their own teaching role. To become involved with students in project-centered education, to work in an interdisciplinary setting, to maintain relationships with graduates, and to become interested in social problems outside the university will require a different set of attitudes on the part of professors. We must look, therefore, to the graduate training which we currently give to the individuals who will ultimately become the teachers, scholars, and researchers in our professional schools. If we cannot loosen up the concept of what a professor is, we will ultimately fail in loosening up the concept of the role-innovative professional.

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"We are living in what is the fastest changing and most exciting period in our history; researchers are potential contributors to the betterment of our society; they become its informers. Information deserves—in fact, demands—acceptance and utilization. There must occur a meeting of minds, an acceptance which will enable both these cultures, the knowledge holders and the power wielders, to draw on each other when the need arises." (Photo: Ivan Massar from Black Star)



The sciences of society are beset by the same issues which confound the physical and engineering sciences: both theory—and the problems to which it is addressed—proliferate, but there is a growing gulf between “men with knowledge who lack power and men with power who lack knowledge”

Warren G. Bennis
Vice-President for Academic Development
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The Failure and Promise of the Social Sciences

Few people would argue with the statement that we are living in the most satisfying and the most unsettling period of any that man has spent on earth. It is satisfying because we enjoy and profit from discoveries which enable us to live healthier, longer, more fulfilling lives. It is unsettling because we can no longer be certain that what we know today will be valid tomorrow. Should we move against this current? Or do we navigate it, utilize it, and allow it to lead us into a new era, with an attitude of enthusiasm and audacity? It is not, as Brecht said, “a night of disaster when a man sees the truth.” On the contrary: it is a night of hope; it is disastrous only when “truth” is neglected or misused.

Although they are not new phenomena, the nonutilization of knowledge and the lack of communication among different groups of our society become less tolerable as society finds itself unable to rely on tradition and more dependent on adaptability and the knowledge which facilitates adaptation. We have produced many individuals with highly specialized, greatly useful knowledge for society as a whole; we cannot afford to neglect them, or their contributions. Equally important, they must be aware of the ways in which they can make their contributions most effective and appreciated.

Like C. P. Snow, I feel that there is growing separatism of two isolated cultures. However, I speak not of the chasm between scientist and humanist but of that between men with knowledge who lack power and men with power who lack knowledge.

Nowhere is the “implementation gap” more glaring than in the social sciences. Their literature demonstrates reliable and significant applications for social policy. Yet while theory and science proliferate, translation into practice lags behind. This was true four years ago, when the first draft of this article was prepared—but never published—and it remains true today. In the intervening years a number of problems and examples have come and gone, and many could be cited in place of those which I have chosen to mention.

A most recent example is found in the collapse of a conference in Barbados sponsored in the summer of 1970 by the State University of Buffalo's Center for Comparative Race and Ethnic Studies in an effort to form an assembly for international inter-ethnic research. Dan

Hertzberg of the *Buffalo News* reported how the conferees split into two factions on the first day of the conference: “One was composed of the researchers, mostly in their 20's and 30's, who are natives of under-developed nations like Trinidad, Tanzania, and Ceylon. Opposing them was a loose coalition of older black and white participants, a majority of them Americans. . . . The young black participants criticized the reliance of existing race relations studies on American funds and charged that much of the research these studies produce is just a cover-up for continued racial oppression. . . . In place of present research, the Third World militants suggested racial studies supported by ‘neutral’ sources that would expose the economic exploitation they said lay at the root of racial discrimination. . . . The older American racial scholars defended the use of foundation and government funds, saying these were the only sources of research money available in the field of race relations. . . . The Third World militants made it clear that they were hostile to any racial research connected with American foundations or, above all, the United States government.”

La Critique Est la Vie de la Science

Some of the issues dividing the thinker from the doer may be illuminated by brief appraisals of three recent social science research projects. The social importance of these projects is reflected in their multimillion-dollar budgets. Aside from their monumental proportions, they were ambitious in design, intended to influence national and international policy. All three have come under sharp attack from the clients they were designed to help; and all three have been at the center of extraordinary controversy so serious as to lead to their premature deaths.

The first and most spectacular is Project Camelot. The *cause célèbre*, Camelot was a research study, as described by its task title, of “methods for predicting and influencing social change and internal war potential.” Camelot was to take three to four years and to cost, roughly, \$6 million. The research areas were those where there was considered to exist a high potential for internal revolution; the starting point was Latin America, and proposed future research areas included several countries in Europe, Asia, and Africa. In the first of four phases it was proposed to examine existing data on internal war, and it was during this period that the project was interrupted.

The beginning of the end occurred when an invitation to many American and foreign social scientists to a four-week planning conference stated the objectives of the study and the identity of its sponsor, the U.S. Army.

One of the recipients was Johan Galtung, a Norwegian sociologist teaching in Chile at UNESCO's Latin American Faculty of Social Science, whose area of research is conflict and conflict resolution in underdeveloped countries. According to Irving Horowitz, Galtung gave the following reasons for refusing the invitation: "He could not accept the role of the U.S. Army as a sponsoring agent in a study of counterinsurgency. He could not accept the notion of the Army as an agency of national development; he saw the Army as managing conflict and even promoting conflict. Finally, he could not accept the asymmetry of the project—he found it difficult to understand why there would be studies of counterinsurgency in Latin America, but no studies of 'counterintervention' (conditions under which Latin American nations might intervene in the affairs of the United States)."

In April, 1965, Hugo Nutini, Assistant Professor of Anthropology at the University of Pittsburgh, made a trip to Chile on other academic business. Dr. Nutini offered to speak to his friends in the Chilean academic community about Camelot, and the Camelot authorities accepted his offer. Although Chile was not intended to be one of the countries where research would be done, it was hoped that Chilean social scientists would participate. According to Chilean reports, Dr. Nutini met with Alvaro Bunster, Vice-Chancellor of the University of Chile, and discussed the study without identifying the Army as the sponsor or making it clear which social scientists were involved in the study. At a second meeting, Dr. Nutini was confronted with a copy of the invitation that Galtung had received. Dr. Nutini protested that he knew nothing of the sponsorship, that he had been misinformed and would protest to Washington. At the same time, the letter was turned over to the Chilean press and to members of the Chilean Senate. The time was dramatically inopportune: shortly after the United States' intervention in the Dominican Republic.

Some American sources report a different course of events. Nutini was not given the opportunity to explain who the sponsor was, nor to discuss the study. According to Camelot authorities, Nutini had indicated to them that Camelot was well received by the academic community. These authorities and their sympathizers implied—both in the press and in the congressional hearings—that Communist inspired and dominated organizations and individuals were making "a mountain out of a molehill."

It is true that leftist newspapers especially played up the incident, but not only leftist sympathizers were disturbed about it. In Chile, and throughout Latin America, people of all political opinions were aroused.

Latin Americans were not the only ones concerned about the Pentagon's role in foreign affairs. Congress questioned the disparity between Defense and State

Department budget allocations which gave the Defense Department a much greater funding ability for research than the State Department had. The State Department expressed concern that this kind of research was being done by the Defense Department and that such sponsorship might have a damaging effect on foreign affairs. The State Department was accused in some governmental and academic circles of deliberately leaking the crisis to the press to emphasize the question of appropriate sponsorship. Both senators and representatives who expressed themselves on the subject questioned the role of the military in the area of foreign affairs and social science research abroad.

Academicians were concerned over the image of social science research and its future. They protested censorship and questioned the ability of the State Department to evaluate research. Few parties were satisfied with the situation as it stood after Camelot.

Two other studies, far less controversial but similar in certain respects, will be briefly mentioned.

For several years the M.I.T. Center for International Studies operated an office in New Delhi. This office, contrary to allegations in the Indian press, was not funded by the Central Intelligence Agency, although a small portion of research had at one time been sponsored by them. However, believing in such sponsorship, Indians expected the Center to respond to U.S. rather than to Indian policy. The office is now closed and the work of this group has been rejected by the Indian community it presumed to aid, despite its resources, experience, and competent professionals. Moreover, it was sharply criticized by the press, government, and academic community for theorizing without regard to the Indian setting and for not collaborating in its offices and councils with competent and concerned Indian nationals.

The third episode involves a sociological study of the Air Force, on a grant from the Air Force.

The Russell Sage Foundation had undertaken (November, 1959) "a study of the effects of nonintellective factors on academic and career achievement." Part of the response population was composed of middle-range business executives. Three years later it was thought that field-grade military officers would be an appropriate group for comparison.

The Air Force Office of Scientific Research approved the proposal in the fall of 1963 and granted it research funds. Despite Air Force sponsorship, there was difficulty in obtaining a volunteer research sample. However, the sampling Branch of the Air Force eventually provided for the selection of a response population of 2,700 officers, and a reports control number, which makes response mandatory, was assigned. The questionnaires were sent in November, 1964, to the headquarters of the various commands, to be distributed to the different bases. Response was not expected until March 15, 1965. But the study was cancelled early in the year, apparently on the basis of complaints from participants.

Causes for Failure?

Why did these three projects fail? Are they exceptional, or are they only the most egregious symptoms of a more pervasive ailment? Assuredly, valuable work is being done by countless social scientists in government, industry, hospitals, and universities. However, an examination of these unsuccessful projects should be of assistance to any who work in this area.

The causes for failure appear to be four: sponsorship, clearance, communication, and collaboration.

The Camelot project was sponsored by the American government. The Indian Center was inaccurately perceived as receiving such support and was unable to rid itself of the label. Such sponsorship indicated a particularly unilateral, pragmatic purpose. In their criticism of these projects, both Latin Americans and Indians mention the sponsorship as cause for doubting the credibility of the approach.

The proposed host countries of Camelot apparently did not understand the project and its intent. Although statements were made that these parties had been adequately informed, the greater number of assertions emphasized that *henceforth* no such research would be done in a foreign country without that country's prior knowledge and consent. It is surprising that students of human behavior were not more aware of the sensitivity or distaste that the topic of internal revolution could evoke. As Senator William Fulbright, who is not trained as a social scientist, put it, "The reason for its offensiveness [Project Camelot] is obvious to anyone with an iota of common sense and it seems to me it should also have been obvious to the highly trained 'scientists' at American University, as well as to the Army. At a time when United States-Latin American relations are complicated by our intervention in the Dominican Republic, it is not surprising that a project like Camelot should be interpreted as having some pertinence to a possible future U.S. military intervention in Chile in the event of a revolution. In any case, studies of possible insurgency movements within a country are an extremely delicate matter . . ."

Some of this offensiveness could have been alleviated by adequate clearance, acceptance, or at least discussion with top-level members of the State Department and the American ambassador in each of the countries involved.

This failure to go to the top for commitment, as well as to gain the cooperation, clearance, opinion, and advice of *all relevant* parties to the research effort, both subjects and clients, betrays the prevalent naïveté which cannot be explained solely by the fact that social scientists have had very little experience and *no* preparation in applying their knowledge. The claim that no one could find out why the Air Force research had been cancelled or, in fact, who ordered the cancellation only emphasizes the pathos of incommunication with authority.

In both the Camelot project and that of the Indian Center, foreign colleagues and field representatives were

not taken into a collaborative relationship; they were not party to the sharing and exchanging of ideas and opinions at all stages of research. In many countries stability and dictatorship go hand in hand with oppression of the people and the absence of progressive government. Perhaps we believe that internal revolution is always Communist inspired and results in a seizure of power. Or is this what we are perceived to believe? Senator Fulbright and others felt that Project Camelot denied the possibility that "internal revolution" could be a change for the better, something to be promoted rather than quashed.

A test of our collaborative spirit would be to allow the converse of this study, a research project with the United States as the subject, as Galtung, the Norwegian sociologist, requested. The spirit of scientific inquiry and cooperation requires it, while avoidance implies that the United States possesses a singular fitness or perspicacity to carry on this kind of research.

The same note of criticism is echoed in the August 9, 1965, editorial of the *New York Times*: "The truly extraordinary misjudgment in these programs lies in the premise that Latin American governments cannot take care of their own internal political problems and need the United States Defense Department to help them out. What is serious about the whole unfortunate venture is its bland misunderstanding of the psychology of Latin Americans and their sensitiveness to Yankee condescension and interference."

In the case of the Indian Office of the M.I.T. Center for International Studies, the hue and cry purportedly arose because the Americans based their suggestions on mathematical models, not on the actual factors in the Indian economy. Some claimed this was an active attempt to delay the progress of the Indian economy and to build it in the style which Americans considered best from their point of view. Why were the Americans, certainly well-intentioned, heedless of the disgust and anguish of their Indian colleagues, colleagues who included in their numbers increasingly influential policy makers? Since the M.I.T. people were extremely competent and well trained within their professions, the explanation must involve a basic difficulty in establishing trust and valid communication with a needful client.

Lack of collaboration is always a disadvantage in a scientific undertaking; it can be a fatal flaw in an undertaking which is designed to explore sensitive areas and areas in which the researcher hopes to influence or teach or help his subjects. (The word *subjects* probably connotes the general impersonal attitude social scientists hold toward their informants. The rub is that subjects, these days, can talk back and create international scenes.) Giving help is always easier than receiving help, for the former implies some expertise or superiority while the latter smacks of weakness and inadequacy. The psychology of giving help is beyond the scope of this article but clearly must be understood if U.S. foreign policy is to work.

But to criticize is far easier and safer than to remedy or to suggest some remedies—our concern here.

Recommendations: To Change the Value System

In the glare of the publicity that followed Camelot, it became evident that those people with power—congressional, military, and executive—were not convinced of the worth of social science research. Although Dante B. Fascell, as Chairman of the House Subcommittee on International Organizations and Movements which investigated Camelot, stated that he believed that social science research was a valuable source of knowledge and should be supported and encouraged, the Camelot failure gave impetus to those who doubted its value.

At the same time, social scientists criticized the skeptics who, they claimed, did not understand the necessity of social science research. Those with knowledge were becoming alienated from those with power; neither, with few exceptions, would look at the others' view.

With so many valid ideas missing their mark, with social science articles (written in the foreign language of the professional social scientist) mildewing in inaccessible journals, and with policy makers ignorant or indifferent—if not antagonistic—to pivotal facts, it is inappropriate, if not dangerous, to be obsessed by the perils of closer cooperation between men of science and men of action. The ally of power is not necessarily the "servant of power." Recently, for example, the California legislators who were responsible for drafting a new law on the control and rehabilitation of drug addicts said that their opinion was largely formed by their friends, druggists, family doctors, and lobbies. They were either unaware of or antagonistic to the findings of specialists who have produced a prodigious literature on this issue.

My specific recommendations fall into seven headings:

1. *Deepen and broaden mutual understanding between scientists and policy makers.* What we must have if this increasing alienation between the two cultures is to be diminished and finally obliterated is an understanding by each of the other's system of values.

This is not limited to the social scientist. James Reston, writing in the *New York Times* on February 13, 1969, advocated: "The most creative minds in America on most of these questions [different areas of U.S. foreign policy] are not in the government today, but in the universities, the foundations, and elsewhere in private life. They would respond to an appeal by Senator Fulbright to testify before the cameras and could in the process help bring about a much wider understanding in Congress and the nation of the problems facing the President. . . . The American experts and scholars on China have not been heard in open hearings on this subject since the Sino-Soviet split. What do the old China hands and the new Orientalists think of this convulsive new force in the world? It is not at all clear that the Executive or the Congress knows."

2. *Develop the science of science utilization.* It is not original to say that the work being done by social scientists is valuable and should be useful; nor is it particularly innovative to say that there should be more research in the social sciences because such research can produce helpful data. However, what few people

have considered and what seems to merit increasing and vital attention is research on the utilization of knowledge. I believe that the social sciences must focus on the research area of knowledge utilization immediately; without such research, all data loses some of its potential effectiveness at the pace we are acquiring new knowledge. It is a horrifying waste of human and material resources not to incorporate what is being learned into our way of life.

3. *The yield of social science must be loud and clear—and useful.* To exercise influence and effect, social scientists must make their achievements visible; they need an equivalent of the Manhattan project. Not until the atom bomb did the full import of research in physical science register with the general population. As in every other area of man's endeavor, so must it be in this one: worth is measured by the tangible product.

4. *The public must lend vigorous support to larger social science efforts.* Before massive social science yields can be regularly produced, the public must invest in its future on a scale larger than anything we know of today. Research activity accomplishes many purposes aside from the main one of adding to the store of certified "truth." It creates a bold, risk-taking culture. The hum of active research attracts brighter young people; it develops confidence in its various publics. The federal government is in the position to grant greater research funds than any private or public foundation or university. Yet a government which can grant—with very little soul-searching—billions of dollars for work on weapons systems grants haltingly and on a yearly basis precarious millions to the social sciences.

We are by no means denying or belittling the importance of defense research, nor are we unaware of the recent increase in the federal expenditure of funds in the social sciences. We are insisting on the unrealized, certainly underemphasized, importance of research in the social sciences. Such research, since it concerns human beings, is of inestimable importance in an age which knows it is moving swiftly, but is not sure, as the Victorians were, of its direction.

It is important to acknowledge that a good deal of progress has been made over the past two years with respect to federal attention to the financial needs of the social sciences—especially of the applied social sciences. The report of the President's Task Force on Science Policy, on which I served, brings the social sciences to center stage. Two other reports of the National Science Board and the National Academy of Sciences' Behavioral and Social Sciences Survey Committee (see *suggested readings*) reinforce the Task Force report. But implementation still remains wanting.

5. *Social scientists must be social as well as scientific.* The practice and vision of social science, too, is predominantly Victorian, having been nourished in the great European universities of the latter half of the nineteenth century. We see social scientists subject their subjects to tests, tricks, games, deceptions, tortures, to say nothing of psychological mayhem, with authoritarian

detachment—as if subjects did not have intelligence, feelings, hypotheses, and expectations as well as some urges to subvert the whole experiment. There must always be understanding of the people with whom the social scientist works, and involvement with them, whether they are subjects or clients. There must be a strong commitment and responsibility to the idea of collaboration and mutual benefit. Indeed, this attitude is not only appropriate and fitting to the scientific ethic; it is necessary. Without trust and commitment to the research task, the data generated are often phony, stilted, and incomplete—if not downright misleading.

The solution to this problem is not completely within the grasp of the individual social scientist. Rather, it is in the realm of those institutions which produce Ph.D.'s in the social sciences. It is astonishing that the apprentice social scientist at no time in his graduate education obtains any formal instruction in one of his primary tasks, teaching. It is equally shocking that he receives no systematic practice or supervision in the human side of the research enterprise. Understanding is not a flash of lightning or a divine gift. It is learned.

6. More knowledge must be produced about transmitting knowledge across political and academic frontiers. We must learn more about the social and psychological aspects of technical assistance. The reactions of the Indians and Latin Americans to U.S. "helping"—whether economic or intellectual—must be understood and dealt with. These same reactions can be multiplied in Europe, Africa, and the Middle East, where so-called Yankee cultural imperialism becomes a stock phrase. Were the consequences less damaging, it would be amusing to compare the earlier attitudes toward colonialists with the present attitudes toward U.S. aid programs. The Ugly American is no less pathetic than Colonel Blimp. Both caricatures betray the plight of a healthy, rich, and well-intentioned people trying to help those less fortunate. The trick is to help without making dependent children or rebellious critics.

We know very little about this process of helping the "have-nots." Paradoxically, there is an enormous store of experience in this area footloose today. I refer to the overseas Americans in the Peace Corps, A.I.D., Fulbright, and various university programs. Their experiences, if recorded and codified, could be disseminated for training and development.

An important step in this direction has recently been made by a group in the Sloan School of Management at M.I.T., which has completed an evaluation of the School's foreign programs—the Fellows in Africa and later the Fellows in Colombia—conducted in the early 1960's. Their study—soon to be published—will be one of the first systematic studies of "innocents abroad" and should be emulated by other such projects. Congratulations are due to Carroll L. Wilson, Professor of Management who conceived and directed the programs, and to the Ford Foundation who financed both the programs and the subsequent evaluation.

And it is becoming clear that our overseas "change-agents" have been "practicing up" for a full agenda

here at home. As we become more aware of our undeveloped regions, our pockets of poverty, and our communal tensions, we see that no society becomes truly great unless it learns to give and receive help in a mature way; and this is a process that must be learned. We have become increasingly in the past few years a "service oriented" society; for the first time in world history more people are working in the U.S. in the service than in the production industries. Even the "haves" must learn how to be both better clients and better experts.

7. The social scientist must re-examine and modify his own values. The social scientist must aim for and achieve to some degree complete honesty in his research. He must not attempt to conceal the motives or the sponsor of his research, since the eventual denouement is inevitable and can destroy his research beyond repair. Similarly, his sponsor must respect the social scientist and honestly, thoroughly, and thoughtfully consider his objections, altering the plan of action if those criticisms are merited.

We are living in what is the fastest changing and most exciting period in our history; researchers are potential contributors to the betterment of our society: they become its informers. Information deserves—in fact, demands—acceptance and utilization. There must occur a meeting of minds, an acceptance which will enable both these cultures, the knowledge holders and the power wielders, to draw on each other when the need arises.

Perhaps Camelot was a disaster only in an immediate sense; perhaps the forces that it set in motion will provide a re-examination, revitalization, and, finally, re-affirmation of social science research. No idea, no matter how valid, can make a conquest by direct assault. We need to understand, far better than we do now, how to get the right ones in the right hands.

Suggested Readings

President's Task Force on Science Policy, *The Social Sciences*, U.S. Government Printing Office, Washington, April, 1970

Special Commission on the Social Sciences of the National Science Board, *Knowledge Into Action: Improving the Use of the Social Sciences*, National Science Foundation N.S.F. Report NSB 69-3, U.S. Government Printing Office, Washington, 1969.

Behavioral and Social Sciences Survey Committee of the National Academy of Science, *The Behavioral and Social Sciences: Outlook and Needs*, National Academy of Sciences, Washington, 1969.

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Having approved just over a year ago the application of the first small carrier to propose leasing microwave communications channels to the public, the Federal Communications Commission has now been flooded with more than 1,700 new microwave-station applications covering some 40,000 route miles of new common-carrier communication facilities. The Commission is now restudying the national telecommunications policy under which these proposals will—or will not—be approved. (Photo: Raytheon Co.)



For handling the growing traffic in digital data and other specialized communications, separate new systems have been proposed which both complement and compete with the present telephone network. The Federal Communications Commission now has a huge backlog of proposals, and the responsibility of a major policy decision

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Communications Carriers: Evolution or Revolution?

In August, 1969, the Federal Communications Commission approved the application of a small new company to lease microwave communications channels to the public between Chicago and St. Louis. This sounds like an innocuous enough proposal, but the F.C.C.'s decision stood the communications industry on its ear; within ten months the Commission was flooded with more than 1,700 new microwave-station applications by dozens of firms proposing to construct some 40,000 route miles of new common-carrier communication facilities throughout the country.

Many of the applicants are affiliated with the company which started it all, Microwave Communications, Inc. (M.C.I.), and propose to offer similar services to the public in different areas of the country. Dedicated point-to-point communication channels of various types and bandwidths would be leased to subscribers, "customized" for use in transmitting voice, data, teletype, facsimile, remote metering, or other specified kinds of electrical signals between business offices, industrial and educational facilities, and government agencies.

Most of the remaining applicants propose M.C.I.-like "private line" services, but one applicant stands out with a distinctly different type of system and service concept. Data Transmission Company (Datran), a subsidiary of University Computing Company, proposes to construct and operate a coast-to-coast all-digital microwave system, with computer-controlled switching centers along the route, which would be dedicated to providing both dial-up and private-line circuits for data transmission.

Having approved the first small specialized carrier last year, and having subsequently been inundated with applications for similar but larger and overlapping systems, the F.C.C. felt the need for further examination of the broad policy and procedural issues involved. In July, 1970, the Commission therefore invited public comment regarding the desirability of authorizing specialized carriers and proposed tentative guidelines for the establishment and operation of such carriers.

At this writing, comments are due in early October. The Commission's conclusions in this inquiry will determine whether, and within what framework, new carriers such as M.C.I. and Datran will be permitted to provide communications service to the public.

The Telecommunications Milieu

F.C.C. authorization of some or all of these proposed new common-carrier services would reflect a major shift in national telecommunications policy and would significantly affect the future shape of the industry. Historically, there has been a single national communications network, operated by the telephone companies and the Western Union Telegraph Co. and geared to the needs of the traditional voice and telegraph customers. There has been little place for competition or for a variety of specialized carriers. The relatively small number of communications users who have specialized requirements (e.g., for facsimile transmission) have had to "make do" with the standard carrier offerings.

During the past decade, new communications requirements have emerged and grown rapidly. The digital computer, which during the 1960's left its infancy and became an indispensable part of American business life, is responsible for many of these new requirements. Early computers were almost always operated in a stand-alone, batch-processing fashion and made little use of communications. But in recent years, not only has the number of computers in use increased enormously, but also advances in computer technology have made remote-access computing increasingly common; examples include conversational time sharing, remote batch processing, administrative message switching, on-line systems for banking and airline reservations, and off-line uses such as data gathering from remote sensors.

Remote-access systems require data communications circuits to and from the computer(s); such circuits must presently be obtained from the conventional voice telephone network. But, as will be seen later, this may not be an optimal solution. The rapid increase in the number and variety of data terminal devices in use, and of applications for these devices, has led to an increasing disparity between the users' requirements and the commercial carriers' service offerings. For example, data users complain about inadequate choice of channel bandwidths, high incidence of transmission errors, and inappropriate pricing structures.

The common carriers (both existing and potential future) certainly have a problem in responding to demands such as these, but it is not an insoluble problem. The same advances in solid-state and digital technology which have generated many of today's specialized com-

munications requirements have also provided new means of satisfying these requirements: synchronous communication satellites, high-capacity digital transmission systems, low-cost reliable solid-state microwave systems, and computer-based message-switching and circuit-switching systems. In the public interest, the challenge is to maximize the early and effective use of this technology, subject to several economic and regulatory constraints. The F.C.C. has traditionally been slow and relatively ineffectual in coping with this sort of challenge, but the outlook may be improving.

Several important F.C.C. actions of recent years indicate that the Commission is beginning to adopt a more enlightened approach toward increasing the efficiency and flexibility of common-carrier services by allowing competition in lieu of or in addition to traditional regulatory methods. In 1968 the Commission issued its now-famous *Carterfone* decision which opened the door for competitive supply of subscriber-owned equipment to be attached directly to the dial-telephone network. Early this year, in its computer/communications inquiry, the F.C.C. tentatively concluded that competitive provision of certain computer-based communication services should be permitted. Shortly thereafter, the Commission for the first time permitted cable-TV firms in the 100 largest metropolitan areas to import signals from distant TV stations, thus increasing program diversity for viewers and competition among broadcasters.

The F.C.C. is not alone in its move toward increased competition. In late 1968, President Johnson's Task Force on Communications Policy submitted a comprehensive report favoring increased competition in domestic common-carrier communications and specifically endorsing the specialized-carrier concept at issue here. In his 1970 Economic Report to Congress, President Nixon said, with respect to communications, that "regulation should be carried out (so) . . . that it does not prevent or limit competition in sectors that are not natural monopolies." In accordance with this principle, President Nixon urged that the F.C.C. approve all technically and financially qualified proposals to put up communications satellites over the U.S.; the Commission acted on this recommendation and promptly invited proposals from all interested parties. Approval of competitively operated domestic communication satellites would be a radical departure from past regulatory practice—similar to the F.C.C.'s departure in approving M.C.I. last summer—but this move appears to be in the offing.

Microwave Technology and Regulation

Microwave transmission technology was developed during World War II for antiaircraft radar by Bell Telephone Laboratories and the M.I.T. Instrumentation Laboratory. Microwave frequencies (roughly 1 to 30 GHz) were soon found to be particularly suitable for high-reliability point-to-point communications for two reasons: microwave signals can be focused into narrow beams which require little transmitter power, so the same frequencies can be used by adjacent systems without causing mutual interference; and such frequencies offer substantial usable bandwidth—enough for the transmission of several thousand simultaneous voice conversations over a single microwave radio beam.

A typical microwave system involves a series of relay towers, spaced about 20 or 30 miles apart, each within line-of-sight of the next. Installation costs are low compared with the costs of laying coaxial cables underground or stringing cable from pole to pole, and the construction time is measured in months rather than years. Today, microwave is the workhorse of long-haul communications, providing some 70 per cent of all interstate voice-channel mileage.

The use of microwave links in the United States is supervised by the Federal Communications Commission which, under the Communications Act of 1934, regulates use of the electromagnetic spectrum and licenses all radio transmitters in the U.S. Under this authority the Commission initially limited the use of microwave radio to the established communications common carriers.

In 1959, in what has become known as the *Above 890* decision, the F.C.C. concluded that private organizations should also be permitted to build and operate microwave systems, although only for their own use. Shortly thereafter, numerous private microwave systems were constructed—largely by right-of-way companies (railroads, pipeline firms, etc.), public utilities, and state and local governments—for purposes of voice, data, and telegraph communications, remote metering, supervisory control and signaling.

The major prerequisites for the construction of a private microwave system are heavy demand for point-to-point communication capacity over a given route, plus the financial and technical resources necessary for the system's construction and operation. The size of the capital investment alone would preclude most corporations from using private microwave systems for their communication needs. However, if a number of corporations can share the same system, it then becomes financially feasible. To provide the flexibility of private microwave systems, without burdening the user with heavy capital investment requirements and operating responsibilities, the specialized microwave common-carrier concept was proposed by Jack Goeken, a young entrepreneur from Joliet, Ill., who formed Microwave Communications, Inc. in 1963.

The Saga of Jack the Giant Killer

In December of 1963, M.C.I. filed an application with the F.C.C. for authorization to construct and operate a common-carrier microwave system between Chicago and St. Louis. M.C.I.'s "specialized" or, alternatively, "customized" common-carrier concept was to offer a wide range of leased-line services, with unusually flexible tariff features. (The table on p. 47 traces the evolution of this specialized carrier concept.)

The F.C.C. returned M.C.I.'s original application as deficient because state authorization for the provision of intrastate common carrier services had not been obtained from the Illinois Commerce Commission. M.C.I. amended its application and dropped its petition for intrastate authorization; the F.C.C. then accepted the application for processing, insofar as interstate authority was sought. A.T.&T., Western Union, and General Telephone and Electronics strongly opposed the new would-

Less than seven years ago Microwave Communications Inc. filed its first application with the Federal Communications Commission to build a common-carrier microwave system between Chicago and St. Louis. The chronology below shows how this single proposal has developed into 1,713 microwave station applications on file at the F.C.C. by July 1, 1970—and how action has followed petition.

INTERDATA New York City to Washington, D.C.
M.C.I. New York West
M.C.I. Pacific Coast
M.C.I. North Central States
M.C.I. New England
M.C.I. Michigan
M.C.I. Ill. Louis Texas
M.C.I. Texas East Microwave
M.C.I. Mid-Atlantic Communications
M.C.I. Kentucky Central
M.C.I. Texas-Pacific

Number of
Microwave
Stations

17
13
11
10
9
8
7
6
5
4
3
2
1

Approved
June, 1970
July, 1970
September, 1969
September, 1968
November, 1967
November, 1966
December, 1965
February, 1970
April, 1970
April, 1969
April, 1968
April, 1967
April, 1966
April, 1965

Early	1940's	Microwave technology developed.
	1945	Microwave first used by communications common carriers.
	1959	F.C.C. issues <i>Above 890</i> decision authorizing private microwave systems.
	1960	A.T.&T. introduces bulk discount private line service (Telpak) to counter competition of private microwave.
December	1963	M.C.I. files with F.C.C. for authorization to construct Chicago-St. Louis common-carrier microwave system.
February	1966	F.C.C. sets M.C.I. application for hearing.
Spring	1967	F.C.C. hearings on M.C.I. applications.
October	1967	F.C.C. hearing examiner issues Initial Decision approving M.C.I.'s application; established carriers appeal to the full Commission.
April	1968	Oral argument before the full Commission.
December	1968	Interdata Communications, Inc. files with F.C.C. for authorization to construct M.C.I.-like microwave system between New York City and Washington, D.C.
December	1968	President's Task Force on Communications Policy submits report endorsing specialized common-carrier concept.
February	1969	A.T.&T. permits sharing of its voice-grade and telegraph-grade private line services (sharing was a service feature previously proposed by M.C.I.).
March	1969	A.T.&T. announces Series 11,000 wideband private line service largely designed to compete with M.C.I.
August	1969	F.C.C. grants M.C.I. construction permits (six years after M.C.I.'s original application).
September	1969	Established carriers petition F.C.C. to reconsider its M.C.I. decision.
September-December	1969	Four M.C.I. affiliates file applications for various routes, and one non-M.C.I. firm (New York-Penn Microwave Corp.) files for one of the same routes.
November	1969	Data Transmission Company (Datran), a subsidiary of University Computing Company, files application for nationwide common-carrier system using digital microwave and computer switching, designed exclusively for data transmission.
January	1970	F.C.C. denies established carriers' petition for reconsideration of its M.C.I. decision.
February-March	1970	Nine more firms (one M.C.I. affiliate, eight independent firms) file specialized carrier applications.
March	1970	A.T.&T. appeals F.C.C.'s M.C.I. decision to the U. S. Court of Appeals (Washington, D.C., Circuit).
March	1970	M.C.I. files with F.C.C. to modify its construction permits for the Chicago-St. Louis system (largely to increase capacity).
April-June	1970	Twenty-one more firms (7 M.C.I. affiliates, 14 independent firms) file specialized carrier applications. (A total of 1,713 microwave station applications for specialized carrier services were on file at the F.C.C. by the end of June.)
July	1970	F.C.C. issues notice of inquiry and tentative rule making regarding specialized carriers (Docket No. 18920).
October	1970	Public comments due in F.C.C. specialized carrier inquiry.
November	1970	Reply comments due in F.C.C. specialized carrier inquiry.

Upon the decision of the Federal Communications Commission await plans for more than 40 intercity common-carrier microwave routes involving more than 1,700 microwave relay stations. The confrontation between technology and public policy remains tense.

be carrier, alleging that the proposed system would cause harmful frequency interference to existing microwave systems, would deprive the public of the benefits of economies of scale, would disrupt the present practice of pricing private line services uniformly across the nation irrespective of actual costs (known as average-cost pricing), would provide unreliable service, and so forth. The F.C.C., in February, 1966, concluded that a hearing would be required to determine whether granting the application would serve the public interest.

Evidentiary hearings were held in the spring of 1967, and later that year the hearing examiner's initial decision, authorizing the proposed system, was released. A.T.&T. *et al.* took exception to the initial decision and requested an opportunity for oral argument before the full Commission. The hearing was held in April, 1968, and in August, 1969 after an unusually long period of deliberation the Commission voted four-to-three in favor of M.C.I. The established carriers filed Petitions for Reconsideration, which the F.C.C. denied in January, 1970; the carriers then filed a last-ditch appeal which is currently pending before the Washington, D.C., Circuit Court of Appeals, and which is likely to be denied.

During the year following the authorization of the Chicago-St. Louis system, M.C.I. and several dozen other companies filed applications for more than 40 intercity routes involving more than 1,700 microwave relay stations. (The table on p. 49 details these applications, and the maps on p. 52 show the five most extensive network proposals.) Several of the new applicants presently operate extensive microwave systems for their own private use or for carrying video signals to distant television broadcast stations or cable TV operators. Western Telecommunications, Inc., for example, operates approximately 14,000 route miles of video relay microwave service in 16 western states. The Southern Pacific Railway, another applicant, operates private microwave systems along its rail right-of-ways. Both companies propose to use their existing facilities to offer common-carrier voice and data channels, thereby achieving economies for present and future subscribers.

Most of these specialized carriers, as previously mentioned, would offer a broad range of dedicated point-to-point channels for various communication requirements, including data transmission. However, their forte may well become the transmission of computer

data (Datran, of course, would offer *only* data services), partly because of the shortcomings in the present telephone network when used for nonvoice communications.

Data Transmission in the U.S. Today

Virtually all data communications today is over ordinary telephone and telegraph channels supplied by the telephone companies (the Bell System and some 1,900 other, mostly small and rural, independent telephone companies) and by Western Union Telegraph Company. In a few instances companies with private microwave or cable facilities transmit digital data over their own facilities rather than over common carrier channels.

Despite the extensive use of the telephone system for data transmission—largely because it is widely available and because there are few practical alternatives for most users—it is generally recognized that the telephone network is not optimally suited to handling data. To quote a Bell Telephone Laboratories statement: "The telephone network was developed for speech transmission and its characteristics were designed to fit that objective. Hence, it is recognized that the use of it for a distinctly different purpose, such as data transmission, may impose compromises both in the medium and in the special services contemplated."

One important shortcoming of today's telephone network is its heavy reliance upon media designed for the inherently analog (continuous wave form) nature of speech. In contrast, digital data signals consist of discrete pulses which must be converted into analog form (e.g., into audible tones) to be sent over the telephone network. Significant costs are incurred in performing this analog-digital conversion at each end of a telephone line; the necessary modulation/demodulation devices (commonly called modems or data sets) range in price from several hundred to several thousand dollars (depending principally upon their data transmission speed).

Analog communications facilities are also likely to cause errors during the transmission of data. All signals tend to lose power as they pass through a transmission system and must be amplified at regular intervals to restore their strength. An *analog* network employs linear (proportional) amplifiers for this purpose; along with the desired signal, all spurious noise is cumulatively ampli-

Company and Proposed Route	Date Filed	Number of Microwave Stations
M.C.I. AFFILIATES		
M.C.I. (Chicago to St. Louis)	Approved	11
M.C.I. (Extension of original system)	June, 1970	20
M.C.I. (Extension of original system)	July, 1970	13
INTERDATA (New York City to Washington, D. C.)	December, 1968	11
M.C.I. New York West	September, 1969	65
M.C.I. Pacific Coast	November, 1969	56
M.C.I. North Central States	November, 1969	16
M.C.I. New England	December, 1969	17
M.C.I. Michigan	February, 1970	26
M.C.I. St. Louis-Texas	April, 1970	42
M.C.I. Texas East Microwave	April, 1970	34
M.C.I. Mid-Atlantic Communications	April, 1970	37
M.C.I. Kentucky Central	April, 1970	34
M.C.I. Texas-Pacific	April, 1970	64
M.C.I. Mid-Continent Communications	June, 1970	57
M.C.I. Mid-South	June, 1970	48
M.C.I. Indiana-Ohio	July, 1970	31
M.C.I. Texas East Microwave (extension)	July, 1970	8
	TOTAL	590
DATRAM (U.C.C. Subsidiary)		
35 major metropolitan areas, Boston to San Francisco	November, 1969	244
SOUTHERN PACIFIC		
San Diego to Seattle	February, 1970	57
St. Louis to Los Angeles	April, 1970	95
	TOTAL	152
WESTERN TELECOMMUNICATIONS		
San Diego to Seattle	February, 1970	26
Los Angeles to El Paso	April, 1970	18
Minneapolis/St. Paul to Sioux Falls, S. D.	June, 1970	8
Sioux Falls, S.D., to Denver	June, 1970	27
Denver to Kansas City	June, 1970	32
Cedar Point, N.M., to Albuquerque	July, 1970	6
Sandia Crest, N.M., to Colorado Springs	July, 1970	8
Denver to San Francisco	August, 1970	25
	TOTAL	150
UNITED VIDEO		
Chicago to Fort Worth/Dallas	March, 1970	94
Fort Worth/Dallas to Houston	April, 1970	5
Houston to New Orleans	April, 1970	24
New Orleans to Chicago	April, 1970	69
	TOTAL	192
NEBRASKA CONSOLIDATED COMMUNICATIONS CO.		
Minneapolis/St. Paul to Houston	April, 1970	130
NEW YORK PENN MICROWAVE		
New York to Chicago	November, 1969	67
Washington, D.C., to Boston	February, 1970	22
	TOTAL	89
ASTRON CORP.		
San Diego to Seattle	February, 1970	56
MICROWAVE SERVICE CO.		
San Diego to Seattle	February, 1970	65
MICROWAVE TRANSMISSION CORP. (U.C.C. Subsidiary)		
Los Angeles to San Francisco	February, 1970	15
MITRAN		
Minneapolis/St. Paul to Chicago	March, 1970	22
CPI MICROWAVE		
Fort Worth/Dallas to Houston	April, 1970	26
WEST TEXAS MICROWAVE		
Fort Worth/Dallas to El Paso	April, 1970	31
ASSOCIATED INDEPENDENT TELEPHONE MICROWAVE		
Houston to New Orleans	June, 1970	17
TELEPHONE UTILITIES SERVICE CORP.		
Central Texas Region	June, 1970	36

fied. A *digital* network, which carries a stream of binary pulses, uses nonlinear "regenerative" repeaters; these respond only to pulses of a specified strength and frequency and thus cannot be used on analog waveforms. Since such repeaters do not pass noise which is below a given intensity level, digital networks offer substantial advantage over analog circuits as regards error performance in data transmission.

Another significant source of data-transmission error is impulse noise from the older electro-mechanical switchgear used in the telephone system; and since such noise does not interfere with voice communications, this equipment is not scheduled for replacement for many years. Other inadequacies in today's telephone network when used for certain data transmission applications include the length of time required to dial and establish a connection, which ranges from 15 to 30 seconds, and a pricing structure designed around the statistics of voice telephone calls.

The M.C.I. System

The M.C.I.-affiliated companies (see table on p. 49) are each proposing to build and operate separate but compatible regional systems, owned and operated locally. The M.C.I. carriers would interconnect their systems and cooperate with each other in order to provide a nationwide private-line communications network. To assist in the development of this nationwide network, a service company called Microwave Communications of America, Inc., (MI-COM) has been formed: MI-COM would provide services to all the M.C.I. carriers in areas such as system design and construction, advisory and information services (regulatory and industry relations, long-range planning, etc.), and national marketing and billing.

The M.C.I.-carrier applicants claim that their proposed systems would offer the following features:

- ◇ Channels for the transmission of voice, data, facsimile, teletype, telemetry, control, and video signals;
- ◇ A wide variety of channel bandwidths (e.g., 200, 400, 600 . . . 1,000 Hz; 2, 4, 6 . . . 16 kHz; 20, 24, 28 . . . 48 kHz; 64, 80, 112 . . . 240 kHz; and 288, 336, 384 . . . 960 kHz);
- ◇ Specially designed data channels with error rates of only one error per ten million bits transmitted, and with prices based on data speed rather than bandwidth;
- ◇ Analog or digital signal inputs;
- ◇ A variety of channel arrangements: simplex (one-way), full-duplex (two-way), and asymmetrical (two-way, with different bandwidths) transmission;
- ◇ Channels available on either a part-time (day or night) or full-time (24 hours per day, seven days per week) basis;
- ◇ Customers would be permitted to share channels;
- ◇ Customers would be permitted to interconnect their own equipment or communication systems to M.C.I. channels, using M.C.I. tower and shelter space for their equipment if desired; and
- ◇ Rates would, in many cases, be substantially lower than those charged by the existing carriers for comparable service.

Although many of these features would be entirely new, M.C.I. emphasizes that the basic distinction between the

proposed services and the present ones "is not the facility itself but the *manner* in which a customer may utilize it in order to provide a customized intracompany point-to-point communications system of his own design and capability." For example, free to choose among the above-listed features, a customer may lease channels of the exact bandwidth required, transmit any form of signal (voice, data, facsimile, etc.), arrange two-way channels with different bandwidths in each direction, use his own multiplex and terminal equipment, resell the unused portion of his channel to another organization, and so forth.

Another distinction between the specialized common-carrier concept and the traditional telephone service philosophy is in the provision of local channels (called "local loops") between the customer's office location and the carrier's microwave terminal. Whereas the telephone companies always provide "end-to-end" service, M.C.I. originally proposed to build and operate only an intercity microwave system, leaving the tower-to-subscriber local loops to be filled in by the individual subscriber. Perhaps realizing the limited marketability of such an approach, M.C.I. now proposes three options for local loops:

- ◇ The customer, or M.C.I. acting as his agent, could obtain the needed channels from the local telephone company. (The F.C.C. has said on several occasions that it would *require* the telephone companies to furnish such service on a reasonable basis if requested; refusal to provide service would also raise antitrust questions.)
- ◇ M.C.I. could furnish local loop channels itself, as a tariffed common-carrier service. Radiated line-of-sight transmission would most likely be used, employing equipment such as short-range microwave, millimeter-wave, or infrared transceiver units which could be mounted on the subscriber's rooftop. Additionally, where feasible—such as within a large office building or industrial park—cable transmission could be used, in lieu of or as an extension to the line-of-sight facilities.
- ◇ The customer could provide his own local loops, using line-of-sight or cable transmission media, where his volume of traffic and other factors would make this economically attractive.

The flexibility inherent in this approach, and the opportunity to take advantage of advanced means of short-haul transmission, offer potentially important benefits for specialized carriers and their customers; however, at least in the short run, insuring the availability of adequate and economical local loops poses a challenge for the new carrier applicants.

With the exception of Datran, the specialized carrier applicants who are not affiliated with M.C.I. are basically proposing systems similar to and compatible with M.C.I.'s. It takes little imagination to envision a future national network of interconnected specialized carriers such as these, which would both complement and compete with the existing telephone network.

The Datran System

Datran's thinking is perhaps best understood in terms of

the new communications technology it hopes to use (whereas M.C.I., as we have seen, would employ more conventional hardware but emphasize the *manner* of use). Datran proposes to build and operate, on a common-carrier basis, a switched, all-digital, nationwide communications network specifically designed and engineered for data transmission. Initially, the system would consist of 244 microwave repeater stations laid out in a backbone route across the U.S. in the shape of the letter "W" (see the map on p. 52). Spur routes from this spinal cord would link to additional cities, initially providing service to 35 metropolitan areas.

The Datran system would employ time-division multiplexing (T.D.M.), which interleaves many low-speed digital pulse streams into one high-speed pulse stream, combined with digital microwave equipment for long-haul transmission. By contrast, the telephone network—today almost entirely analog rather than digital in nature—is built around the older techniques of frequency-division multiplexing (F.D.M.) and analog microwave transmission. (Digital microwave carrier techniques have to date been employed mainly in experimental and military systems.) With respect to local loops, Datran (in part because of the all-digital nature of its system) proposes to provide from the outset all local loop facilities needed to provide its customers access to the system.

Switching for dial-up data calls would be done by computer-controlled circuit-switching facilities, similar in concept to the telephone companies' Electronic Switching System. Ultimately, Datran proposes, "store-and-forward" message switching might be added. This would permit the transmission of messages and data between otherwise incompatible data terminals, differing in their transmission speeds or character codes. (If a message can be stored for a time en route, its format can be changed before retransmission.)

While neither the switching, long-haul transmission, or local distribution equipment needed by Datran can be obtained "off the shelf" today, the company expects that the necessary hardware will be commercially available by the time the F.C.C. approves its application.

The major features of the proposed Datran system include the following:

- ◇ Digital signals would be carried directly, without the need for a modem to convert them to analog form;
- ◇ The data error rate would be less than one bit in error per ten million bits transmitted;
- ◇ Four different transmission speeds (150, 4,800, 9,600, and 14,400 bits per second) would be available—on either a switched or leased-line basis;
- ◇ Simultaneous two-way (full duplex) data transmission at high speeds would be possible (high-speed transmission over the present switched telephone network is possible only in one direction at a time);
- ◇ "Connect time" for dial-up data calls would be under three seconds;
- ◇ A "busy signal" due to network overloading would occur no more than once per one hundred dial attempts; and

◇ The minimum-charge time for a dial-up call would be only six seconds, rather than the minimum of three minutes (or one minute, during late evening hours) of the telephone network.

In previous F.C.C. investigations of data communications, computer users have expressed a need for common-carrier services with these characteristics. Accordingly, although implementation of its plans will undoubtedly prove challenging for Datran, industry interest is high.

Meanwhile, Back at the Ranch

So far, we have concentrated upon the "revolution" aspect of our "evolution or revolution?" title, because that's where the action is today, and that's where the most important policy decisions will soon be made. But these decisions cannot be made in a vacuum. Our national communications network is not a static entity; rather, it is dynamic, always evolving (albeit quite slowly) both from a technological and regulatory standpoint.

For example, the technological makeup of the present communications network is gradually shifting toward the digital transmission concept embodied in the Datran proposal. The telephone companies have for several years been installing digital carrier systems for short-haul interexchange trunks (the T-1 system, which is largely limited to 50 miles distance) and are slowly starting to install similar medium-haul systems (the T-2 carrier, which is useful up to several hundred miles distance). In the late 1970's, Bell plans to introduce transcontinental digital transmission systems (the T-5 carrier), partially to meet anticipated circuit requirements for Picturephone service.

Western Union also plans to introduce digital transmission systems into its network, as illustrated by the telegraph company's proposal in recent months to build a "hybrid" combination digital-and-analog microwave system between Atlanta and Cincinnati. Both the Bell and Western Union approaches promise reduced costs for all communications users, and over the long term they could potentially offer order-of-magnitude savings for data transmission.

Another important development, both evolutionary and revolutionary in nature, is the F.C.C.'s decision to entertain proposals for the construction and operation of domestic communications satellite systems by the established carriers and other organizations. At the time of writing, Western Union has already submitted a proposal for a system of this type, involving three satellites in synchronous orbit above the U.S. and six earth stations strategically located throughout the country. Additional satellite proposals may be submitted shortly from organizations such as the Communications Satellite Corporation (COMSAT), A.T.&T., and the television networks.

While digital transmission systems and domestic communications satellites are beyond the scope of this discussion, the advent of such advanced communications facilities will promote the availability of special-

The new common-carrier proposals add up to about 40,000 miles of microwave links. Shown here are the five most extensive proposed networks.

ized communications services of all kinds. Accordingly, such developments will undoubtedly be considered in future regulatory decisions regarding specialized carriers.

Policy Considerations

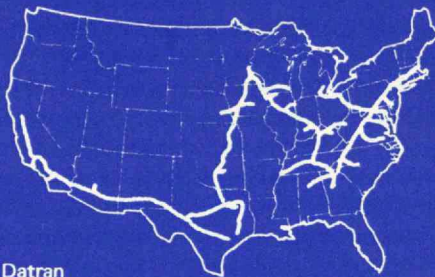
A number of complex and interrelated factors must be considered in deciding whether or not new carriers, such as M.C.I. and Datran, should be authorized in the future. Since each type of carrier proposes to use microwave radio, the first consideration must be the availability and efficient utilization of the scarce radio frequency spectrum. The F.C.C.'s *Above 890* decision, mentioned earlier, found sufficient frequencies available for private microwave systems. Since the proposed common-carrier microwave systems would use the spectrum more efficiently (they would carry more channels per microwave beam), they should not be denied on these grounds. Although potential frequency interference among adjacent microwave stations is an increasingly acute problem in some metropolitan areas, this can be resolved on a case-by-case basis through coordination among the affected microwave operators.

A more important policy objection advanced by the established carriers is the fact that significant economies of scale exist in the provision of communication services; therefore, they argue, the overall cost to the public is lowest with an exclusive common-carrier monopoly. Economies of scale clearly exist in long-haul transmission systems, as shown in the chart on p. 53, although often these are not passed directly on to the public unless competitive pressure forces it (e.g., Bell introduced its Telpak service, offering drastically reduced prices for "packages" of leased voice channels, when competition in the form of private microwave systems was introduced). Also, the potential of high-capacity transmission systems for lower cost per channel is diluted by long periods of low utilization and by the industry practice of averaging the costs of new systems with the costs of older and more expensive equipment still in use.

Unfortunately, economies of scale may often be achieved only at the expense of other desirable economies. To achieve maximum economies of scale, a single carrier must consolidate diverse service requirements and provide a limited range of standardized services, thereby foregoing potential economies of



MCI



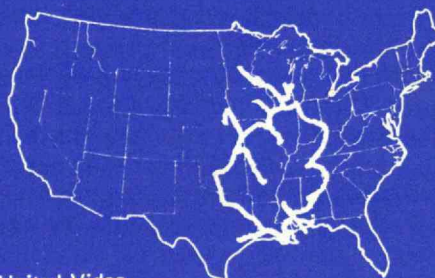
Datran



Southern Pacific



NCCC



United Video

specialization. Where virtually all users require standard voice services, the single-supplier approach is clearly desirable. However, where a substantial and rapidly growing fraction of subscribers require assorted transmission services, such as for data communications, the attempt to employ a single carrier system to satisfy all requirements may degrade service to all classes of subscribers and offset the scale economies of a single system.

In the M.C.I. proceeding, the burden of proving the nature and extent of economies of scale rested with the established carriers—the telephone companies and Western Union—who chose to submit little data on the subject. Certain facts, however, are well known. The telephone companies' revenues for all private-line services account for only 5 per cent of total revenues (although private-line mileage is a larger percentage of total mileage). It is therefore quite unlikely that a division of the private-line market between the established carriers and the new specialized carriers (who would also generate new demand by providing new services) would have any significant effect upon the scale economies of the present network. This is even more apparent when the projected 12 to 15 per cent annual growth of the national network is considered—A.T.&T. estimates that its physical plant will be four times as large in 1980 as it is today!

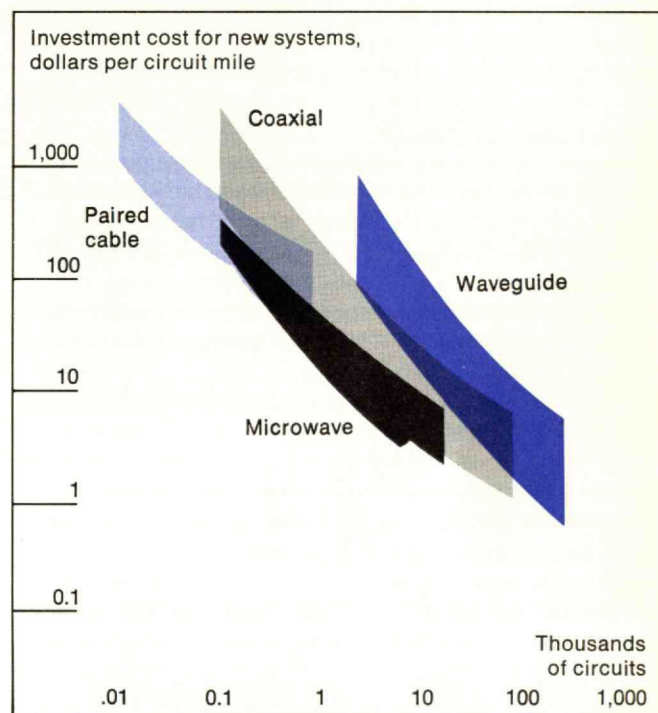
Implicit in discussions of the economies of scale is the assumption that new carriers will offer services identical to presently available services, thereby duplicating existing facilities. Where this is in fact true, lost economies of scale must be weighed against the benefits of competition. But where proposed services differ from available services—either in terms of the physical characteristics of the channel offerings, the tariff regulations regarding their use, the pricing structure, the service reliability, or other important characteristics—the degree of duplication is reduced considerably, and any lost economies of scale must then be compared with the value of introducing a previously unavailable service, in addition to the competitive effects of introducing a new carrier.

The Fat Cats and the Cream Skimmers

Another major policy consideration related to the entry of new carriers is their effect upon the telephone companies' current practice of averaging the costs of their facilities across the nation and charging uniform rates for interstate services, irrespective of the actual costs of providing that service in a particular locality.

The established carriers contend that such geographic rate averaging is in the public interest, since it permits them to offer reasonably priced service in localities where costs are high, thereby ensuring the widespread availability of telephone service to the benefit of all subscribers. They further contend that new carriers serving only selected high-traffic, low-cost intercity routes "skim the cream" off the communications market—to the detriment of the general public—by pricing their channels below the "average" prices charged by the larger carriers. Ultimately, it is argued, the large carriers would serve only the high-cost areas

One of the arguments against the new carriers is that their introduction would tend to sacrifice the economies of scale obtained with a single monopoly system. Economies of scale for different communications technologies are illustrated here. The point is discussed on p. 52.



and would be forced to increase the rates charged to subscribers. The existing carriers refer to activity of this sort by small firms as "cream skimming," and oppose it, claiming that the new firms' *actual* costs may be higher than those of the larger carriers in the same localities, while the diversion of traffic would adversely affect the scale economies of the larger carriers.

These arguments have a certain intuitive appeal, though they may be questioned on a number of grounds. First, the new carriers under consideration here primarily propose to offer private-line service and will therefore affect the rate averaging for only this service, not for dial-telephone service. Furthermore, many would argue that there is no justification for a cost-averaging scheme in which companies located in heavy communication regions subsidize the private-line communication services of companies in more rural regions. In fact, economic theory suggests that a more optimal allocation of resources occurs where goods and services are priced according to *actual* costs. Apparently agreeing with this view, the F.C.C. Hearing Examiner in the M.C.I. case commented, "the averaging method is

embodied neither in the Decalogue nor in the Constitution."

Second, the cream-skimming argument assumes that the established carriers are fully and adequately serving the potential market; the facts suggest otherwise. We have seen that users with specialized communications requirements, especially for data transmission, have found the standard telephone network facilities and services inadequate. And the recent deterioration of telephone service in several metropolitan areas has introduced an additional dimension into the comparison between user needs and services provided. Indeed, the existence of a gap in certain types of communications service was perhaps the prime motivation for the proposal of new specialized carriers.

A third reason for questioning the cream-skimming argument is that it assumes the new entrants will operate only over high density routes. In fact, the initial plans of many of the applicants include the offering of service in areas with low population density, since such areas happen to be where certain of those applicants have existing microwave facilities. Also, it can be expected that other systems which would initially be urban-oriented will in time grow to include outlying areas as well. After all, those new carriers who propose to operate initially over the heavily trafficked routes are only exercising good business judgment; the established carriers do likewise when introducing any new service (e.g., A.T.&T. proposed to offer Picturephone service initially only between Pittsburgh's Golden Triangle area and lower Manhattan).

Although it is difficult to estimate how the established carriers would actually react to the entry of new competitors, the comments of William M. Ellinghaus, Executive Vice-President of A.T.&T., are enlightening: "If the F.C.C. approves enough of these high-volume route applications and these companies begin consistently underpricing us along these routes, we will give very serious thought to our whole system of average pricing. If the result is that in order for us to maintain our fair share of the market we have to move away from average pricing to so-called route pricing, then we will do so."

Since the specialized carrier applicants can in the foreseeable future hope to capture only a very small portion of A.T.&T.'s private-line business in addition to

the new business which they would generate through their more efficient and more flexible service offerings, it is questionable whether A.T.&T. would find it desirable from an overall standpoint to move to route-by-route pricing for private lines; conceivably, such a move could reduce, rather than increase, telephone company revenues. Furthermore, although route pricing may be desirable according to economic theory, it would greatly complicate the user's task of configuring and optimizing (minimizing the costs of) an extensive private line network.

Other Regulatory Issues

One of the questions which the F.C.C. must, by law, carefully consider before authorizing any of the present backlog of applicants is the extent of the need for services or service features which are not presently available. But need is best measured by the acid test of the marketplace. On the one hand, potential subscribers who consistently claim that they need new services may prove less enthusiastic when asked to commit funds. On the other hand, many applications of new and highly flexible communications services are not yet conceived. Users are unlikely even to recognize these applications until services are actually available; therefore a priori market estimates for such services will necessarily be imprecise, and actual experience is the only reliable indicator.

Yet another factor under consideration by the F.C.C. is the potential value of specialized carriers as a regulatory tool. The regulation of public utilities is an imperfect surrogate for competition, necessary in those industries where free competition is impractical. No one seriously disputes the need for such regulation in the communications common-carrier industry. However, if competition among communications carriers can also be encouraged, we are no longer solely dependent upon government regulation. The existence of competitive carriers also gives the regulatory agency comparative yardsticks by which to evaluate carrier performance in regard to operating costs, prices charged to the public, responsiveness to users' requirements, efficient use of new technology, and so on.

The final question facing the F.C.C., if it continues to authorize specialized carriers, is: Should only one specialized carrier be granted a license to operate on each geographic route, or should open competition prevail? Assuming the desirability of establishing specialized carriers, little rationale can be found for granting each a monopoly franchise in a particular area of the country. As long as there is a market sufficient to support more than one entrant (as it appears there is), the benefits of competition, specialization, and improved responsiveness to user requirements accruing from the introduction of one specialized carrier should be increased by bringing in more. The F.C.C.'s tentative decision issued in July adopted this view—that comparative hearings on claims of economic exclusivity should not be held; rather, each license application would be considered on its own merits, independent of any other applications for the same route.

If in fact multiple entry is authorized by the F.C.C., firms

proposing to serve the same or overlapping regions of the country (such as along the Pacific Coast, where five specialized carrier applications have been filed) may well negotiate among themselves to minimize areas of competition, or may decide to combine their applications, or in certain cases may drop out of the running. The extent of antitrust and regulatory constraints on such agreements is unclear at this time, although similar practices are common among potential broadcast station applicants. The *de facto* end result of an open-entry policy might in some cases be nearly the same as if the Commission had granted exclusive franchises to specialized carrier applicants.

The Outcome

At this writing, the outcome of the F.C.C.'s deliberations on specialized carriers cannot be predicted with great accuracy. The Commission's staff has strongly recommended approval of the M.C.I.-type private-line carriers, and has suggested separate consideration of Datran's proposal. A motion to adopt the staff's recommendation as a tentative decision of the Commission itself failed by a 3-3 vote, effectively tabling the matter for the time being. (Interestingly, a new Commissioner appointed after that vote, whose views are as yet unknown, may provide the "swing" vote when the F.C.C. next considers its policies towards new carriers.)

In order to throw more light on the issues, the Commission then, as we have seen, initiated a formal public inquiry, and has suspended action on the subject pending receipt of comments from interested parties in October, and reply comments in November. Hearings and oral argument on some of the issues may be found necessary after that point, or the Commission may decide to resolve the question without further ado.

In addition to the present antagonists—the would-be new entrants and their archenemies, the established carriers—a number of interested parties will probably make their views known to the F.C.C. in its inquiry. Large communications users and communications equipment manufacturers (who see a potentially large new market for their wares) can be expected to support the specialized carrier concept, whereas several influential organizations sympathetic to the existing carriers (including, surprisingly, the National Association of Regulatory Utility Commissioners which represents the various state public utility commissions) will most likely oppose it. Members of the computer industry, such as computer equipment manufacturers and time-sharing service bureaus, may well be the most emphatic in their expressions of need for new communications services, especially for data transmission, either provided by the established carriers, or by new entrants, or both.

In summary, it appears that major changes in the common-carrier communications industry are in the offing. Specific details are as yet unknown, but we have tried to present the picture as clearly as it can be seen at present. Communications requirements are growing and changing in nature, and the F.C.C. is charged with insuring that the common carriers keep up with these requirements. Fundamental changes in the in-

dustrial structure, such as the establishment of a new class of specialized common carriers, may indeed be needed in order to achieve this goal.

Suggested Readings

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James Martin, *Telecommunications and the Computer*, Prentice-Hall, Inc., Englewood Cliffs, N.J., 1969.

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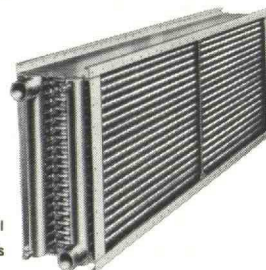
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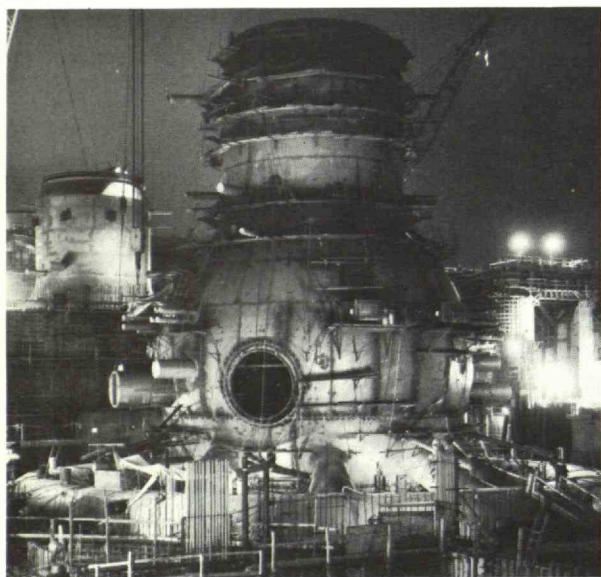
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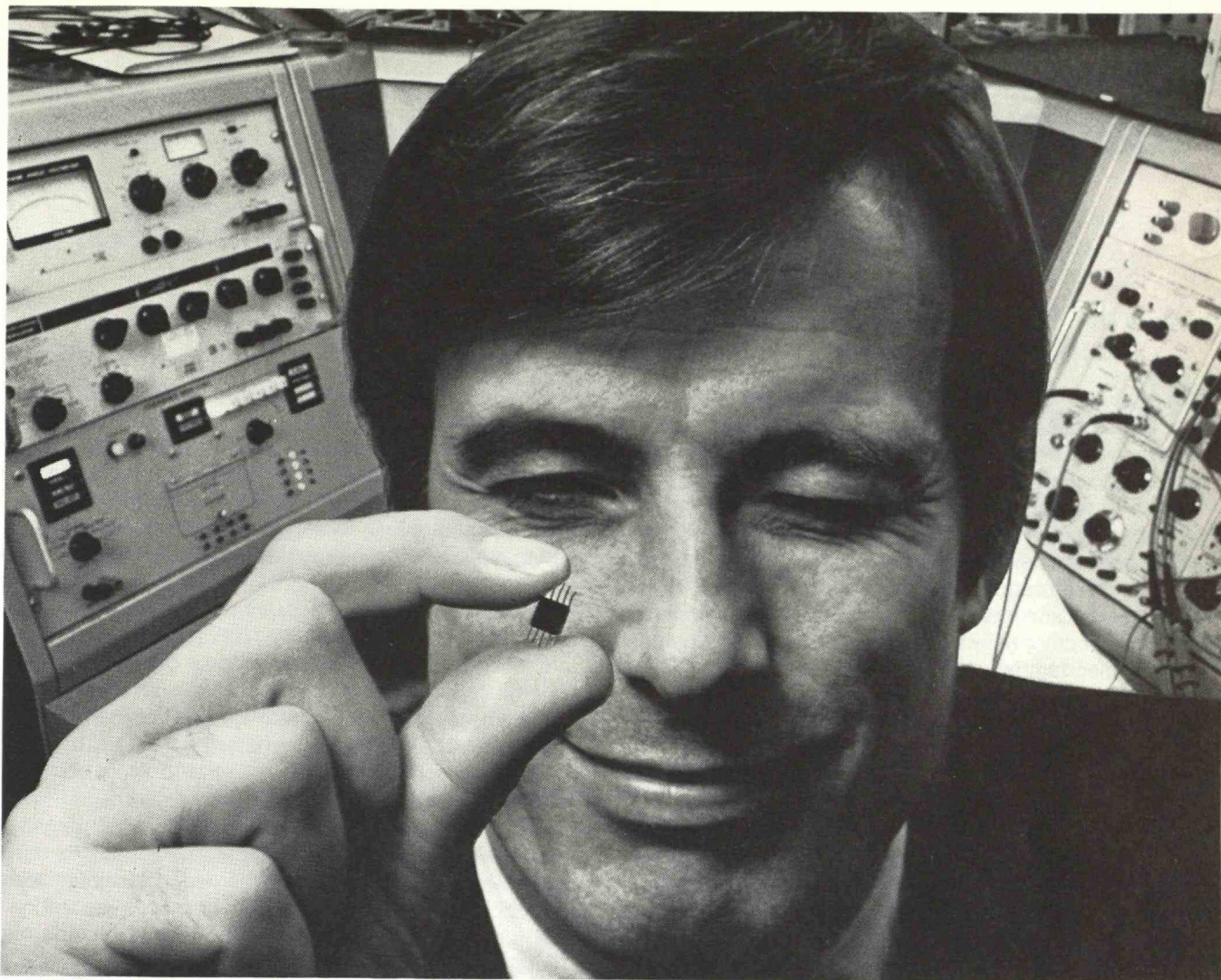
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Trend of Affairs

The Global Pollutants

The Study of Critical Environment Problems (S.C.E.P.) which took place under M.I.T. auspices throughout the month of July (see *Technology Review for June 1970*, p. 73) was in essence an intensive, large-scale, critical review of the literature on man's effects on the rest of the planet. Its aim was to discover what pollutants are important or potentially important on the global scale; to distinguish fact from guesswork as to their magnitudes, routes, and effects; and to make constructive suggestions for their measurement, study, and control.

The results of the study will be published by M.I.T. Press, first in summary form this October and then as a series of specialized volumes in the spring of 1971. The most obvious gain from the study was a new measure of consensus—the coming together of 40 scientists from all relevant disciplines for a month (plus about 60 others for shorter periods) resulted in the abandonment of some entrenched positions, and in the weeding-out of ideas and quantitative estimates that did not stand up to criticism.

In the new field of global pollution-watching this necessary step in the birth of a discipline had not been taken before. The large areas of ignorance that remain, in relation to all forms of global pollution, are now clearly outlined.

What, then, are the global pollutants? There is, first, an atmospheric group, with possible climatic effects but no definitely discernible ecological consequences for the planet as a whole: carbon dioxide, particulate matter (mostly originating from chemically changed industrial gases), and the emissions from transport aircraft. Second, there is a marine group, damaging or potentially damaging to ecological systems: the persistent chlorinated hydrocarbons (DDT being the archetype), the toxic heavy metals such as mercury and lead, the nutrients (of which the most critical by far is phosphorus) and petroleum oil.

Doubts about the Atom

One other potential global pollutant was identified—radioactive wastes from nuclear power, particularly those high-level wastes produced by spent-fuel reprocessing. This particular environmental hazard is unusual

in that it has necessarily been studied and almost completely contained from the first. To re-evaluate adequately the technology and hazards of high-level radioactive waste "disposal" would have been beyond the capabilities of the S.C.E.P. study, but the group addressed to the A.E.C. its concern about the subject, and made the following recommendation:

"That an independent, intensive, multidisciplinary study" (rather like another S.C.E.P., was the feeling) "be made of the trade-offs in national energy policy between fossil fuel and nuclear sources, with a special focus on problems of safe management of the radioactive by-products of nuclear energy, leading to recommendations concerning the content and scale and urgency of needed programs."

The implication is clear: the common tendency to assume that problems raised by the use of fossil fuel can be disposed of by turning to nuclear power generation may just turn out to be unjustified, if the magnitude of the task of managing very large quantities of fission products in perpetuity is squarely faced. The key word, of course, is *independent*.

The Optics of Small Particles

Whereas the effect of adding carbon dioxide to the atmosphere is known (it intercepts infrared radiation escaping from the earth, thus shifting the planet's radiation balance in the warm direction) the effect of adding particles is not. Particle concentrations in the atmosphere are increasing *almost* globally—in Europe, North America, over the North Atlantic, but not over the central Pacific. This could certainly add up to a change in the planet's average radiation properties, but it is not clear in which direction.

The particles of interest in this connection are those less than about 5 microns across. Of these, about one-fifth are at present of industrial origin, although they do not all start out as particles. Of the 1,600 million tons annually entering the atmosphere, 250 million tons are produced by the chemical transformation of man-made sulfur and nitrogen oxides and hydrocarbons,

mostly sulfur dioxide from fossil fuels.

The effect of these particles on incoming solar radiation is not known: they certainly scatter to some extent (which would result in a reduction in the planet's energy input), but it is now clear that they also absorb and thus contribute to the heating of the atmosphere. What is needed is the magnitude of each of these effects. It has certainly been observed that, in clouds, particles cause a reduction in reflectivity, but it is not known by how much.

So—aside from recommending more adequate monitoring of the amounts of particles less than 5 microns in diameter—S.C.E.P. (*see above*) concluded that research is sorely needed on their optical properties, which directly influence the optical properties of another particle, whose diameter is approximately 13,000 km.

How Much Oil?

One of the S.C.E.P. (*see above*) working groups was devoted only to establishing a data base: critically evaluating statistical sources and assigning trustworthy figures to the rates of production and dissemination of polluting substances. The figures they arrived at for petroleum oil leakage from human activities were rather larger than are usually quoted: in all, five million tons a year. They did not commit themselves to a figure for the natural background, but the usual estimate for natural seepage out of oil-bearing rocks is half a million tons a year.

The five million tons of oil which man contributes to nature each year breaks down as follows: From the routine operations of tankers, 0.53 million metric tons; from other kinds of ships, 0.5; from normal offshore production operations, 0.1; from accidental spills, 0.2; from refineries and petrochemical works, 0.3; from highway motor vehicles, 1.8; and from industrial machinery and nonhighway vehicles, 1.3. The last two components are not usually included in such a reckoning. They are estimates of the amounts of used lubricants annually discarded. Their actual routes through man-made disposal systems and natural formations obviously defy analysis, but a great deal of this waste oil presumably finds its way to the sea.

It is noteworthy that automobile crankcases could be a bigger source of marine pollution than all kinds of marine activity together. One suggestion, from another study group, was that spent crankcase oil should be bought back from motorists and garages (with the proceeds of a sales tax) and re-refined. Turning to a smaller component, 94 per cent of the "routine" tanker contribution comes from 20 per cent of the tankers—but how to persuade these tankers to adopt the control measures that the others are using is a knotty problem with ramifications in international politics.

Aid to the Unemployed

A Los Angeles program which aims to increase the job-finding prospects of the unemployed seems likely to be put into action in other parts of the country, if the necessary funds—about \$100,000—can be found.

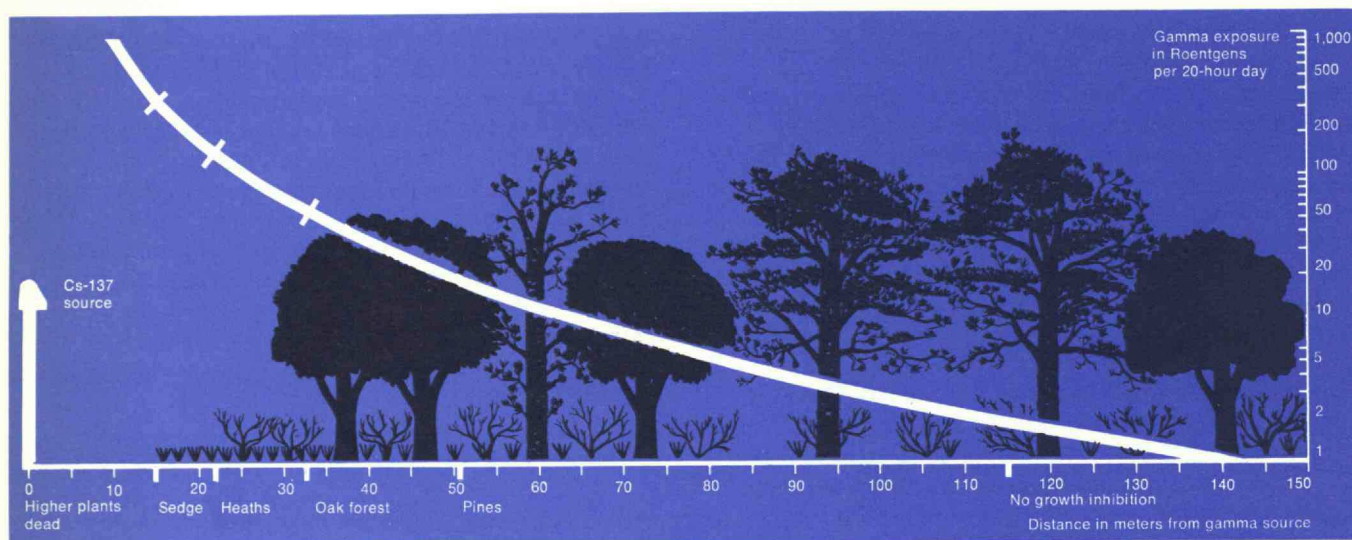
The course consists of three evening "workshops" at weekly intervals. The first is "a morale builder." Unemployed men, in groups of six or seven, each led by a counsellor, tell of their backgrounds, of how they came to be workless, and of their experiences in looking for employment. They are given instruction in writing job applications.

A few drop out after this first session, feeling that they have learned enough; but surveys have shown that the second session is more useful than the first, and the third even more so. The second session is mainly devoted to mutual criticism of attempts at writing applications for work. "The instructions on composing the letter and resume are quite simple and straightforward, yet nine out of ten fail to do them properly; and most do a dreadful job."

The third session centers on mock interviews, uncovering "unconscious and potentially disastrous habits."

In the first few months of this year, over 1,000 registered for the workshops, which were financed by the Los Angeles Section of the American Institute of Aeronautics and Astronautics. This figure represented perhaps 20 per cent of the laid-off aerospace professionals in the area (*Astronautics and Aeronautics*, Vol. 8, No. 6, pp. 74-76).

The layer-by-layer "systemic dissection" of a forest by prolonged erosion from natural or manmade sources is described below. In the Brookhaven experiment, radiation provided the stress, and classic survival zones rapidly became defined, from an area of only lichens and other simple plants to one of full forest. The white line represents the amount of radiation per day that each area received, and the plants sketched illustrate which survived at each level.



The Anatomy of Any Dying Forest

A forest eroded by natural forces degenerates in definite stages. The tallest species die first—the pines, if they are present; then the oaks and maples. Then the tall shrubs, and later the lower shrubs die; then the plants and herbs. Finally only lichens and mosses, simple and adaptable, try to survive. There are thus five phases of destruction. The pattern is found whenever fire or cold or loss of nutrients or water disturbs normal growth.

The same pattern holds when pesticides, sulphur oxides, or radiation destroy plant life, and we can predict from it what will happen to forests now only beginning the sequence. G. M. Woodwell, of the biology department of Brookhaven National Laboratory, describes in *Science* (vol. 168, pp. 429-433) a study of the effects of radiation upon an oak-pine forest. Five distinct areas of damage were found after seven years of irradiation—and their boundaries were clear after only six months.

The central zone received more than 200 roentgens a day, and only lichens and other simple plants lived. The outer zone received less than 2 roentgens per day, and all species survived, although growth was slow. In between was the layer-by-layer "systemic dissection"—

a sedge zone, a shrub zone, and a pineless oak zone.

The same progression has been found in a forest around a smelter in Ontario and, despite the claims of selectivity, in defoliated forests in Southeast Asia. Under intense assault, only the simplest, most easily adaptable plants, the bamboo, for example, remain.

When the variety and depth of the forest is lessened, the plants remaining cannot hold the same range of nutrients, and regrowth of the lost species becomes more difficult. An area in New Hampshire lost, in the first year after trees were cut, twice the amount of nitrogen that would have cycled through the area in a normal year; the rise of nitrate ions in the run-off increased the concentrations of calcium, magnesium, potassium, and sodium, resulting in eutrophication of streams at the expense of the forest.

These nutrients are also lost to the herbivorous, and hence to the carnivorous animals, with a result similar to the change which the plants have undergone: the least specialized survive longer.

Nuclear Mining

In arguing the usefulness of nuclear devices in civil applications where chemical explosives are presently used, proponents often cite the remarkable cheapness of nuclear explosions per unit energy. According to a Lawrence Radiation Laboratory report of 1965, T.N.T. costs \$115 per million Btu., dynamite is slightly cheaper, and nuclear 100-kiloton detonations cost \$1.12 per million Btu. Nuclear explosive energy is cheaper still for larger blasts—a megaton costs only \$.14 per million Btu. The nuclear cost figures are based on A.E.C.'s announced charges.

W. R. Hardwick, of the Bureau of Mines, has worked out what the costs would be for practical mining, where the object of blasting is to break up ore-bearing rock so that it can be hauled to the surface. From first principles, nuclear blasting would be out of the question for small, high-grade ore bodies, where rock breaking must be highly selective. For large ore bodies—which are generally low-grade and are mined at high daily tonnages and low costs per ton—there are a number of mining techniques, depending on the type of rock.

Mr. Hardwick compares the costs of nuclear mining with the "open-stope" and "block-caving" methods, where the rates of mining are generally between 15,000 and 30,000 tons of ore a day and costs are between \$1.15 and \$2.50 a ton. (Open-stope is used for hard rock all of which must be blasted; caving is used in well-fractured rock which needs little or no blasting but requires costly ground support.) He considers the mining of a deposit of 100 million tons of ore at a depth of 1,500 ft., at 15,000 tons a day.

There is a limit to the explosive strengths that can be used without damage to existing mine workings. Mr. Hardwick assumes an ore body that could be broken up progressively by a series of 26 detonations of 70 kilotons during its 20-year life. Extraction shafts would nevertheless need to be placed further from the ore than is conventional. The mining technique is essentially that of reducing the hard ore-bearing rock to a well-fractured condition and then using the caving approach; it is reasonable to compare the economics with those of both the open-stope method (which would be the conventional alternative) and the caving method.

Mining activity	Cost per ton		
	Open stope	Block caving	70-kiloton nuclear explosion
Development	\$0.384	\$0.296	\$0.40
Drilling and blasting	.335	.004	.19
Drawing ore	.275	.338	.30
Drift repair	.007	.465	.46
Haulage	.323	.308	.45
Hoisting	.116	.083	.10
Ventilation and safety	.074	.119	.15
Supervision and engineering	.200	.135	.20
Distributable	.116	.082	.10
TOTAL	\$1.83	\$1.83	\$2.35

The comparison is shown in the table. It will be seen that while there are indeed savings in blasting cost, additional expenses more than outweigh this gain: in repair to drifts (horizontal haulage tunnels), in haulage (over increased distances), and in ventilation and safety measures.

However, nuclear blasting may have an advantage with a completely different extraction method, such as solution mining (which is sometimes used for copper), where underground extraction workings are not required (Bureau of Mines *R.I.* 7391).

Your Daily Pollution Can Kill You

When proof is wanted that air pollution is indeed harmful to life, the disasters of London in 1952, New York in 1966, and Donora in 1948 are usually cited. One may now also cite New York, 1962 to 1965.

From November, 1962, to May, 1965, Dr. Thomas A. Hodgson, of the division of Epidemiological Research at Cornell Medical College, studied daily levels of particulate matter and sulfur dioxide in New York's air, and the city's daily temperature, and then correlated them with daily deaths from heart and respiratory diseases.

sodes, but when there are slight and seemingly innocuous increases in concentration from day to day and month to month."

Which Comes First: Need or Ability?

A technological innovation—say, a new kind of measuring instrument—is conceived when someone notices that a particular capability (such as the piezoelectric effect) can be fitted to a particular need (for pressure sensing in some difficult environment, perhaps). If the idea finds favor with the management, funds are then provided for preliminary design—together with all the detailed problem solving this entails—and the idea is embodied in some tentative piece of hardware.

But how does the matching of capability to need actually happen? Is it done by concentrating on the need and actively searching for something that will satisfy it? Or does someone contemplate a newly discovered physical effect, asking "What could this be used for?" until he hits on a possible application?

The question is not entirely academic. If new technology is mainly stimulated by the attempt to find uses for new knowledge, its scientific content will tend to be of recent discovery, and this tendency will be quite visible. If on the other hand the need comes first, then next year's hardware will feature principles drawn somewhat at random from all periods, for there is no *a priori* reason why the solution to a new problem should be found in new knowledge rather than old.

And in relation to research management: should the innovators in an organization simply be kept informed of new knowledge (and left to work on the needs they know), or should an abundance of perceived needs be actively drawn to their attention?

James M. Utterback, now at Indiana University, studied the origins of ideas for new scientific instruments while at the Sloan School of Management. In an investigation of 32 new instruments he found that 24 had been "need-stimulated" and eight "means-stimulated." This 3:1 proportion echoed previous research findings.

The most successful of the instruments, from the profit and sales viewpoints, were *all* need-stimulated. Fifteen (other) of the instruments had won awards; of these, six were means-stimulated—a statistically significant distinction, which would appear to indicate that prizes are given out for ingenuity in finding plausible applications as well as for demonstrable usefulness. However, "this is not to say that the award-winning products are not also commercially successful." Four of them were extremely successful—of which, oddly enough, three were need-stimulated.

The point about the novelty-contents of the two kinds of innovations was borne out: technical information used in the means-stimulated instruments was between

He reports in *Environmental Science and Technology*, (July, 1970) that an increase of one "coefficient-of-haze unit" (which is the standard measure of the light scattered by particulate matter in the air) brought an increase of 13.4 deaths per day from these illnesses. The normal death rate from these causes is 150 per day.

An average rise of two coefficient-of-haze units from one month to another "is not unreasonable," Dr. Hodgson says, and the difference for any two consecutive days "may be as large as five units." An increase of two units would produce an 18 per cent rise in heart and respiratory deaths, according to his data.

Other pollutants and changes in temperature make more trouble. The daily temperature, by straining the body with sudden changes or exhausting it with prolonged heat or cold, can bring about more deaths. And sulfur compounds, harmful in themselves, paralyze the body's means of filtering particles from the air, and so are doubly problematical.

Dr. Hodgson found that those who died from these environmental stresses were not always those who were very ill and already near death. More deaths were induced among those under 65 than over. Further, he says, air pollution, especially its particulate matter (which includes lead, benzopyrene, and asbestos), induces death more readily than the climate for the younger group; with the older, both are equally important. He found also that changes in these death rates for any given month could be correlated with his monthly indices of pollution. Had heart and respiratory deaths been only of those already near death, Dr. Hodgson writes, the monthly rates would have been independent of these averages.

He stresses that his study observed only short-term acute effects—he did not consider chronic ones from years of exposure.

The relationship between indices of pollution and death rates was a linear one; therefore, Dr. Hodgson explains, the danger per added unit is not less at lower concentrations than at higher ones. Yet, the "primary concern [of public policy] appears to be focused on setting air quality standards . . . [to avoid] the disasters experienced in Donora, London, and New York . . . However, deaths are occurring when there are no such epi-

ten years old and brand new, with a mean age of two years. Information used in the need-stimulated ones was anything up to 56 years old, the mean being 12 years.

How did the innovators find out about the needs? Overwhelmingly, in discussion with people, rather than by reading or any kind of personal experience or research; and mostly in discussion with people outside the innovator's own company—particularly customers.

So the well-beaten path to the door *precedes* the better mousetrap.

Up from the Ground in Ships

One of the duties of the Maritime Administration is to dispose of surplus vessels of the National Defense Reserve Fleet as economically as possible. The scrap value of the ships is about \$50,000 each, and Marad naturally searches for alternatives—either more remunerative or more to the public benefit. The Department of Housing and Urban Development is meanwhile attempting to ease the desperate national shortage of cheap, acceptable housing, and has even begun to support technical innovations with its "Breakthrough" scheme.

Between them, the two agencies have hit on the idea of using spare ships as mobile housing-factories. For one thing, it seems that "procuring, gutting, drydocking, preserving, and towing a vessel" would cost less than building a factory structure of the same floor space. For another, such a factory could be moved to within "35 miles or so" of one erection site after another. One of the problems with factory home-building methods has been where to put the factory, so that it will be used to capacity but will not be serving such a wide area that transport of the factory-built dwelling components becomes uneconomical. The one resounding (commercial) success has been the mobile home; and now A. E. Gibson, Maritime Administrator, and Harold B. Finger, H.U.D.'s Assistant Secretary for Research and Technology, propose the mobile factory.

In May this year, the Department of Commerce sent out invitations to take part in a study which would result in a "preliminary design, bid package, and test plan for the conversion of one or more vessels to a prototype plant." A contract to prepare this design and plan has now been awarded to a team headed by Stanley Works, of New Britain, Conn., and including Pre-Stressed Concrete of Colorado and Slayter Associates. The bid for ship conversion will be prepared by General Dynamics' Quincy Shipbuilding Division. By the end of the year a single prototype plant should have been planned and costed, and the decision as to whether to go ahead and build the floating factory will then be made. If it appears economically and technically feasible, the prototype factory ship should be com-

pleted by the end of 1971.

One of the more intriguing thoughts to emerge from the Office of the Maritime Administrator is that sea-going housing factories might open up "a significant new export market."

Arms for the Third World

Though the noise level associated with the sale of western arms to Third World nations may be increasing, the actual volume of material coming from the industrial nations—as well as its usefulness to those who receive it—has probably declined since the 1950's. Indeed, says Amelia C. Leiss, Research Associate in the Center for International Studies at M.I.T., "to talk of a 'Third World arms race' is misleading and contrary to the facts."

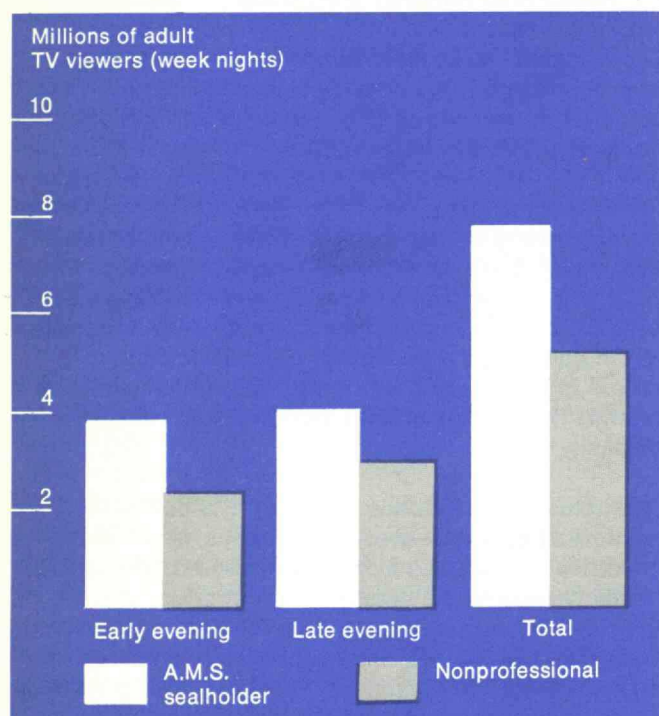
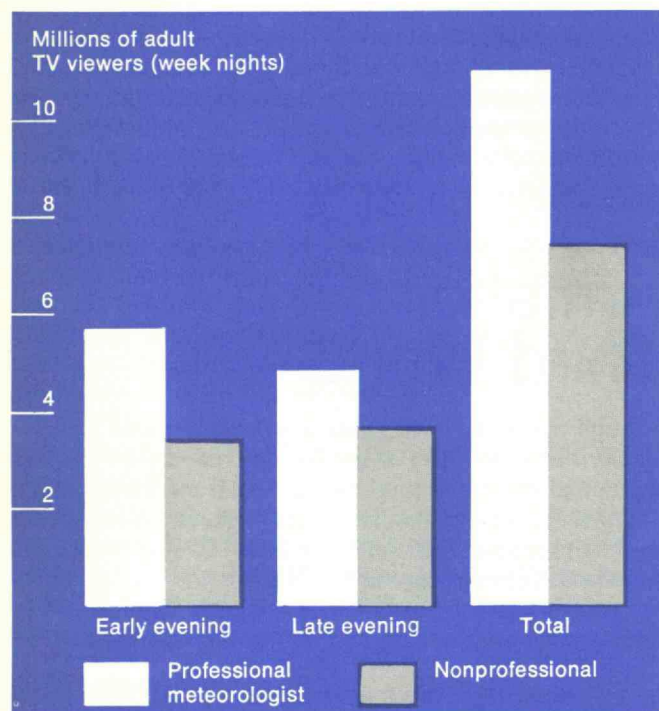
In a three-year project just concluded, Miss Leiss and her colleague Geoffrey Kemp have examined in depth the relationship between arms transfers, military training, and conflicts among the underdeveloped nations. Their studies—sponsored by the U.S. Arms Control and Disarmament Agency—have included data on the actual arms transferred to a sample of 52 Third World nations from all the major industrial powers.

In quantitative terms, they report, the rate of growth of the arms trade is slowing down. This does not mean that some countries are not selling or receiving more arms than in the past. Nor does it mean that the numbers of suppliers and recipients are decreasing; quite to the contrary, the number of different nations involved is constantly growing. But the gross quantities of arms flowing to the Third World are not rising dramatically.

The nature of the trade is changing. For both economic and political—prestige—reasons, Third World countries are now receiving more modern and sophisticated weapons; but these will in fact poorly meet their military needs because in general underdeveloped countries lack the technical capabilities to maintain and use advanced weapons. "For many poor countries," says a C.I.S. report of the project, "large investments

The first chart summarizes viewers' choices between 54 pairs of weather programs—with and without professional meteorologists—in 30 market areas.

Below: same comparison made in those market areas where the professional was an American Meteorological Society sealholder.



in jet aircraft and tanks, rather than in small arms and artillery and trucks, may actually reduce the intensity of conflict between adversaries."

Though the study distinguishes "most dangerous" from "least dangerous" arms races in the Third World, it fails to confirm the hypothesis that the transfer of certain arms in fact causes conflicts. The supply of arms competitively by Russia and the U.S. puts the Arab-Israeli conflict in the "most dangerous" category; but the imitative weapons acquisition patterns of Argentina, Brazil, Chile, and Peru fall into the "least dangerous" group.

The conclusions argue that, in principle, there is no reason for arms transfers not to be used by a major industrial nation such as the U.S. as an important and effective instrument in its foreign policy. "Much of the criticism leveled against the U.S. in its role as the world's largest arms supplier is based more on rhetoric and emotion than on careful analysis," says a project report.

The Weather Show: Exit Clown

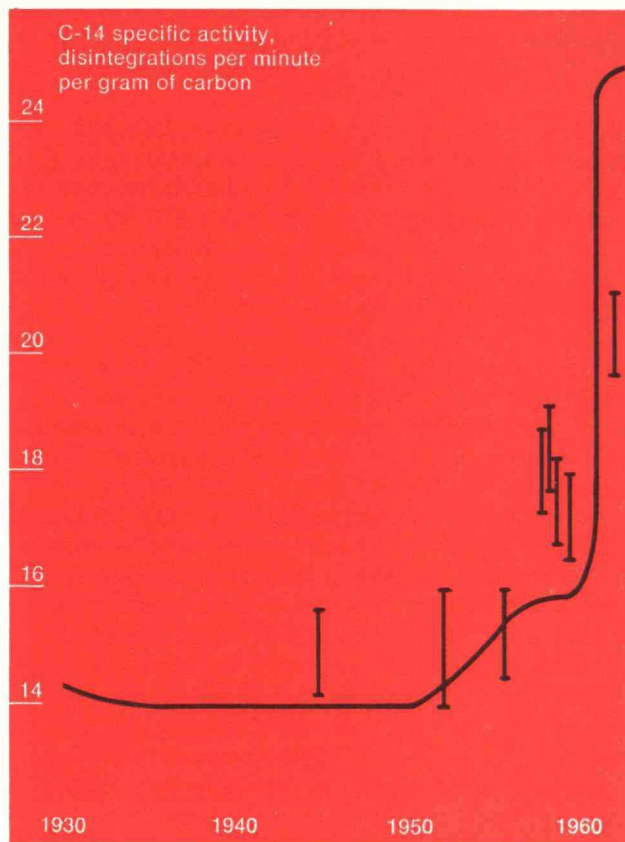
In 1960, a survey by D. Ray Booker showed that TV weather forecasts presented by professional meteorologists received higher ratings than those in which the announcer was a nonprofessional. In recent years the public image of the scientist is said to have become somewhat tarnished. Not, however, that of the meteorologist, to judge from a new survey by Robert G. Beebe, of the Environmental Science Services Administration's Weather Bureau, Silver Spring, Md.

In the 20 years since professional meteorologists first began to be shown on American screens, there has been a steady growth in this practice, until today 58 stations feature 67 meteorologists. At the same time, Beebe notes, "the number of comics, clowns, gimmicks, etc., has been decreasing."

With suitable experimental controls, he compared the ratings of professional meteorologists with those of the competition, for the period February 12 to March 11, 1969. Out of 18.8 million adults watching 54 pairs of weather programs in 30 market areas, 11 million watched the professionals.

Beebe calculates that, if an appearance by a professional meteorologist costs the sponsor \$50 more than he would otherwise have paid, the investment earns extra viewers at a rate of 25 a penny—"a real bargain." But "few sponsors know the difference between professional meteorologists and 'weathermen,'" and the rate of increase in the number of meteorologists televised is only four (not per cent—four) per annum. More active self-promotion is recommended (*Bulletin of the American Meteorological Society*, Vol. 51, pp. 399-400).

Beginning in the 1950's, the carbon-14 content of the atmosphere (solid line) increased abruptly in consequence of atmospheric nuclear testing. Now Bernard Keisch and his colleagues at the Mellon Institute of Carnegie-Mellon University have determined that the carbon-14 content in linseed oil (vertical ranges) has increased similarly, and they propose to use the C-14 content of paints and other organic artists' materials as a means of separating pre-1950 and post-1950 paintings.



A Criterion for the Post-Fissionists

Radioactive dating of paintings by the "white lead" method is now operational—and may distinguish between forgeries produced in the last 75 years and the Old Masters they purported to be. Now new techniques based on effects of the nuclear age itself may lend themselves to dating paintings produced during the present century.

The "white lead" dating method depends on the fact that, once lead is smelted from its ores, the supply of its 210-isotope is no longer replenished by the gradual radioactive decay of radium-226 with which lead is associated in most ores. Thus the purified lead-210 decays (with a 22-year half-life) until it comes into equilibrium

with whatever much smaller amount of radium-226 survives the smelting process.

Modern lead will show the radioactive decay still underway, with lead-210 and radium-226 in imbalance. In old lead the process is complete and the two are in balance. Bernard Keisch, Fellow of the Mellon Institute of Carnegie-Mellon University, believes that carbon-14 may hold the key to a similar procedure for testing paintings which are so recent that the lead-radium-balance method cannot yet be used. He described his plan at the seminar on Applications of Science to the Examination of Works of Art this summer at the Museum of Fine Arts (Boston). It is based on the fact that the atmospheric burden of carbon-14—a long-lived radioisotope—has more than doubled between 1950 and the early 1960's as a result of nuclear testing during that period. Reflecting on this sharp discontinuity, Dr. Keisch and his colleagues set about to answer the question: "Would the carbon-14 concentration of oils used in paintings produced during the last 30 years show the same increase as atmospheric carbon-14 during the same period?"

To their gratification, they found that the difference was indeed detectable in samples of pre-1950 and post-1960 linseed oils; the carbon-14 content of linseed oil follows closely that of the atmosphere.

The next step, now in progress, is to build a sensitive system for measuring carbon-14 concentrations in the tiny samples of paint which can be inconspicuously removed from paintings. "With the present state of technology for such a system," Dr. Keisch told this summer's seminar, "we estimate that samples of 50 mg. of oil paint would be sufficient for our purposes." So he is confident that the method will in fact be successful, predicting that "the successful forgery of art purportedly dating prior to the 1950's will become prohibitively expensive if not virtually impossible."

Beauty, Truth, and Nondestructive Tests

Solid-state detector development, energy dispersion, surface chemistry, gas chromatography, and pyrolysis techniques do not conjure up a vision of delicate esthetic pursuits. But this summer at the Boston Museum of Fine Arts scientists and art historians—experts in the evaluation and restoration of museum objects, many of them from the world's great museums—gathered for an international seminar on the application of just such scientific developments to examination of works of art.

Madeline Hours, Conservator of the French National Museums at the Research Laboratory of the Louvre, said art criticism has come "to a sharp turn—it is now necessary that this criticism be based on . . . criteria defined by scientific results obtained from methods currently used in research and industry, and adapted to the different needs of museum laboratories." She then gave some specific examples:

In the area of authentication, science has all but eliminated a lucrative field of criminal activity. A successful forgery—once manufactured in the cellar by simulating appropriate stylistic effects and surface appearance—must now simulate the techniques of ancient metallurgy and the chemistry of corrosion and stand up to the absolute dating methods made possible by radionuclide analysis (see previous page).

The deluge of information and its quick retrieval and comparison—already bedeviling scholars in other disciplines—is now becoming an issue in museums. If computer-generated art has been less than satisfactory, computer cataloging of art works is rapidly becoming an unqualified necessity.

Accurate chemical and metallurgical analyses enable curators to determine the constituents of art objects, including the proportion of impurities and the provenance of the minerals; to characterize the metallurgical technique; and to establish chronological and historical factors. "To discern the small differences in the alloys, in the techniques of manufacture, in the native impurities of minerals—all help to clarify problems of authen-

ticity, lines of commerce in antiquity, the markets for gold and silver, and finally, the evolution of technology," noted Miss Hours.

But problems remain legion. For example, Leonetto Tintori of the Palazzo Pitti Museo delle Carozze, Florence, Italy, said the most revered Italian frescoes may soon be lost to us because of molds and uncontrolled efflorescence of salts; he sees no hope for their salvation except through rigorous studies of their physics and chemistry.

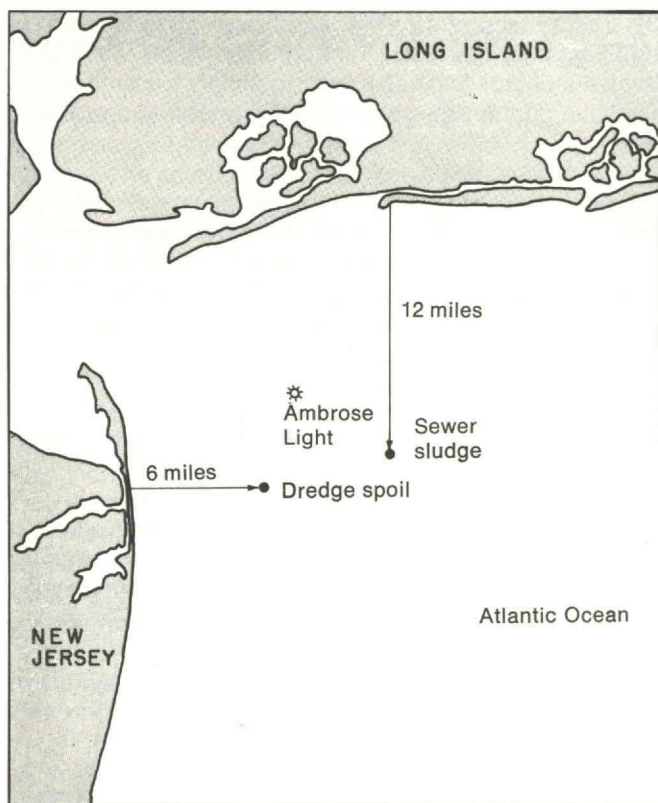
One reason why (in Miss Hours' words) "the uses of scientific methods are only in their beginnings" became clear during the meeting: the relations between scientists and curators are fraught with suspicion and apprehension. The museum director, responsible for preservation of priceless artifacts, is loath to risk their survival in scientific investigations which—while they may produce a wealth of valuable information—require sampling that he fears can endanger the object. During the last 30 years many techniques of investigation, some requiring sampling, some not, have been devised by scientists who understood the reluctance of curators and were at great pains to label their techniques "nondestructive." The nomenclature, however, proved a two-edged sword; the scientists found themselves hoist by their own petard. Some are now advocating that the term nondestructive be avoided entirely in written reports because the very use of the word destructive is "misleading and startling."

A Benighted Bight

Dumping of waste into coastal waters seems to be proceeding apace, with over 100 sites now being used off the east and west coasts and in the Gulf of Mexico. More sites are presently being appointed. The observation of what this will do to the waters and the life in them proceeds at a rather more leisurely rate.

Studies have been made, however, according to *Bio-science* (Vol. 20, pp. 617-619, 669-671), of an area outside New York Harbor, the New York Bight, which has received at two sites during the last four years 11 million cubic yards of dredge spoil and sewage sludge—the most intense dumping of any site. The two areas,

The New York Bight is the area of the Atlantic Ocean just outside New York Harbor. Intensive dumping of dredge spoil and sewer sludge at the two sites shown has destroyed life on the sea floor around them and contaminated the water above. Because dumping here has been heavier than at any other coastal site, the Bight offers a good study of how and why the damage occurred. (Map: Bioscience)



near the Ambrose Light, are respectively, 6 miles from the New Jersey coast and 12 miles from the Long Island coast.

The sludge and spoil are joined by raw sewage (the amount dumped each year near the area by the New York Metropolitan Region would layer Manhattan six inches deep); the effluent carried by the Hudson and East Rivers also wends down to the Bight.

Three shipping lanes intersect at the Ambrose Light, and great amounts of petroleum are dumped in the lanes and in the Harbor. Petroleum extracts and holds pesticides, metal-bearing organic compounds, and solids, and sinks to the bottom of the Bight, or of the Harbor, whence it is dredged and dumped into the Bight. The sea bottom at the dump sites is devoid of visible life.

What it contains now is a concentration of metals such as chromium, lead, and copper; large amounts of oil, phosphorus, and nitrogen; and almost no oxygen. What

it supports now in place of those marine plants and animals which help stabilize the bottom and begin the food chain are viruses and types of bacteria which cause intestinal disease. The dumping is dangerously close to shellfish harvesting grounds—so close that an F.D.A. official has urged that the harvest cease.

How 20 square miles of the Bight have become “dead sea” is a story of badly designed, confusing, and inadequate laws, and of ecological irresponsibility.

Into what coastal waters refuse may be deposited is decided by the Secretary of the Army, and the responsibility has devolved upon the Army Corps of Engineers, subject to his approval. Whether dumping into navigable waters is even legal, however, seems questionable. At any rate, the Department of the Interior and various of its agencies are charged with ensuring that dumping does not endanger marine life. The Defense Department and the Department of the Interior have equal standing, however, and *Bioscience* suggests that Interior is not and cannot be an effective control.

A number of measures have been proposed to clarify the laws and the jurisdictions—for example, placing the civil functions of the Corps of Engineers under the Department of the Interior, or the interesting proposal to dump further out in the ocean. Dr. Bostwick Ketchum, of Woods Hole Oceanographic Institution, suggests that the greater depths, and hence colder temperatures, might well refrigerate the problem and “preserve it for posterity.”

The Patient Computer

One of the most precious commodities in modern medical practice is doctors' time. Within reasonable economic constraints, can information technology applied at key points in the system help extend U.S. medical care by helping to conserve this key commodity?

The question animates a major study of the application of computers to health care which is now under way at M.I.T.'s Lincoln Laboratory and the Beth Israel Hospital, Boston, with additional consultation from members of the Harvard Medical School. For the first phases of the work, Herbert Sherman and Barney Reiffen of Lincoln Laboratory and their Beth Israel associates have chosen as problems two areas in ambulatory medical care: the newly presented medical complaint, when a would-be patient first brings his symptoms to doctor or hospital; and the postdiagnostic check-up procedure as it is used to monitor and manage chronic disease.

Ambulatory medical care represents 90 per cent of patient-physician encounters in today's system and it is responsible for one-third of the nation's medical bill—and the portion, at that, which is least likely to be reimbursed through medical insurance. Hence the Lincoln Laboratory workers' decision to focus their first attention here. Only 6 per cent of first-encounter situations involve an immediate threat to life; the Lincoln Laboratory-Beth Israel work focusses on applying new information systems to the other 94 per cent of such meetings between sufferer and savant.

The basic approach is this: a logical device (simulated for the present by a computer) is programmed with a sequence of questions (called a "protocol"). The device is monitored by a medical aide. This combination substitutes for the physician in obtaining current symptoms and pertinent medical history.

The "protocol" is set up so that each question depends on the patient's answer to previous ones: Do you experience pain? Yes. Where? Abdomen. Upper or lower? and so on. On the basis of answers to such questions, the logic system records a medical history and at the same time directs the medical aide to a

program of laboratory tests; and it also gives the aide sufficient information for him to decide whether to involve a doctor immediately or to simply transmit a narrative printout to a physician for review and further direction.

Field data encourages the belief that most new patients' needs can be met with a small number of such "protocols"; in a survey, ten groups of symptoms accounted for 70 per cent of people's first visits to a doctor. A similar series of individualized "protocols" are proposed for routine check-ups for diabetics, hypertensive patients, and other sufferers of chronic disease who must have regular medical review of their progress or status.

Thus far in the study, which is sponsored at Lincoln Laboratory and Beth Israel by the National Center for Health Services Research and Development of the National Institutes of Health, "rudimentary" protocols for diabetes and hypertension and a protocol on abdominal pain have been written and are now being tested.

But there are more questions than answers. What, for instance, about the patient whose symptoms derive from psychological rather than organic stress? Will the proposal save visits to the physician or must it be combined with the use of psychologically trained aides?

In order to focus on essentials, says Dr. Sherman, the project is deliberately staying away from "exotic problems" in medicine; it's a sufficient challenge, he told a recent Lincoln Laboratory seminar, simply to work out the most straightforward examples by putting the best available medical knowledge into the logical "protocol" form, and leave the physician to deal with the cases that most need his subtler skills.

Dr. Reiffen admits immediately that the proposal is not "high technology" (except perhaps for the overall systems plan, which must satisfy economic criteria). The present experimental protocols use known computer techniques and languages—some of them developed by G. Octo Barnett and his associates in the Laboratory of Computer Science at Massachusetts General Hospital and at Medical Information Technology, Inc. (see *Technology Review* for April, 1970, pp. 56ff.)



M.I.T.'s Computer-Aided Routing System (CARS) developed this small bus as part of its offering to innovation in public transportation. The bus would pick up and deliver passengers at locations of their choice and at moderate cost. Its flexible routes and schedules would be coordinated by a computer. CARS is intended especially to serve the moderate-density areas now covered poorly by fixed-route, often infrequent buses.

CARS and Other Cars

Just getting around is a frustrating part of city life, even for those with automobiles, and those without are barely mobile. The source of the problem—the numbers of people and the tightly used land in which they must move—is quite inflexible.

What to do about it is not so rigidly defined. There are a number of variables in transportation systems, of which the permutations are almost limitless. Vehicles could use city streets, or separate guideways, or both in different locations. They could be powered by internal combustion engines, turbines, or electric motors, conventional or linear; the capacity could be that of a taxi, a subway train, or anything in between; the "containerization" concept suggests that the passenger-carrying unit need not be fixed to the drive or support systems; and "support" need not mean wheels. Also to be decided are questions such as: How should the service respond to demand? Should the driver or the system do the steering? Can public systems be built which approach the kind of service given by the automobile?

At a meeting of the American Society of Civil Engineers in Boston this summer, dedicated to urban mobility, the following were among the arrangements proposed:

◇ One which would use existing streets is the Computer Aided Routing System (CARS), developed at M.I.T. under the direction of Daniel Roos, Associate Professor of Civil Engineering. A citizen in need of transport dials an operator or pushes buttons on a touch telephone to give his address, destination, and possibly the service class he wants. The request reaches a computer which inserts the journey into its ongoing trip schedule and tells the traveller when he will be picked up. A small manually driven bus arrives at his address and delivers him to his destination, with a few intermediate stops for other passengers whose routes are close to his. At each stop the computer tells the driver what the next stop is.

The service would be faster than a regularly scheduled transit service, more direct, and flexible in its routing. It would cost more than present mass transit and less than taxi service: a break-even cost would probably be 50 to 75 cents for a three-mile ride. Dr. Roos estimates it to be economically feasible with as few as 20 buses handling

100 demands per hour in a 10-square-mile area, and especially so in the moderate-density areas poorly served by scheduled buses. A 1968 H.U.D. report to Congress surveyed 20 innovative systems and recommended CARS as the most promising for such areas. Although 100 requests per hour could perhaps be handled manually, the system's main justification lies in the computer's far greater capacity for interleaving large numbers of demands and on-going journeys. The Urban Mass Transportation Administration (U.M.T.A.) has provided \$800,000 of support over the last three years, so that the system is now ready—complete with buses and computer programs—for a practical demonstration, which would take six months to set up.

As of this June, funding ceased. U.M.T.A. is, however, considering financing a project, in Haddonfield, N.J., which would be very similar to CARS but for the lack of a computer, and which would take an estimated 18 months and \$1.5 million to be made operational.

◇ For areas which would not support large, employee-driven vehicles, Stanford Research Institute suggests small, four-seat rental cars, available at stands every few blocks. A passenger would punch in a card for monthly billing, check out a car to drive to his destination, and leave it at another rental station for others to use. A supplementary bus service would carry those who cannot drive.

◇ Another smaller car, this one on a guideway, is the staRRcar, from Alden Self-Transit Systems Corp. A passenger enters a station (stations can be quite closely spaced), passes through an automatic ticketing machine, and steps into a car. He indicates his destination on a panel, and a computer routes him automatically, through the system.

As in other guideway systems, loading, acceleration, and deceleration are done off the main guideway, so through-traffic flows at a steady speed. The car picks up power from wires in the guideway and is steered by horizontal wheels on either side which track the guideways. Because the system controls the speed, direction, and merging of the cars, the distance between vehicles can be minimal—a major advantage in heavy traffic. The cars can also transport freight, and various types of cars can use the same network.

◇ A plan which would use the vehicles we have as well

as whatever new ones might be built is the Pallet Automated Transportation system (PAT) proposed by David G. Wilson, Associate Professor of Mechanical Engineering at M.I.T. The vehicle rides on a pallet which is powered and controlled by synchronous motors driving a cog gear that engages a rack gear on the guideway rail. Again, a computer directs the pallet through the system. The pallets can carry ordinary automobiles (which can also be driven on the streets when not on the guideway), special passenger capsules, or freight containers, which leads Dr. Wilson to describe his plan as "integrative."

◇ Ordinary automobiles might themselves be fitted with a means of locking into a guideway—another way of achieving a dual-mode system. Dwight Baumann of M.I.T.'s Department of Mechanical Engineering has so equipped a Mustang. On the guideway it is powered as well as routed via its guide contact; on city streets or highways it is under its own power and the driver's control.

Which systems, if any, will in time be built and used is an open question. These are by no means the only ones, and just how a city decides which suits its particular problems and circumstances might well be a field of study in itself. Obtaining rights-of-way for extensive guideway systems will be difficult, when the demands for land in the cities are already complex. But the numbers of vehicles already on streets make the addition of others equally problematical.

And Now . . . Underwater Water

Mining, sewage disposal, heat disposal, fresh-water supply—progressively, mankind seems to be returning to the oceans from which our ancestors anciently crawled. Now, from the Bureau of Reclamation, comes the concept of the underwater aqueduct.

It was described at the Transportation Meeting of the American Society of Civil Engineers in Boston this summer, by the Bureau's Ellis L. Armstrong. Dr. Armstrong pointed out that many of the water diversion

schemes currently being planned in the U.S. "would be among the most costly engineering projects in history" and that they inevitably "require some degree of disturbance or displacement of the natural environment." So imagination is called for. The continental shelf offers itself as an unused corridor, 3 to 15 miles wide.

Variable geological conditions and the peculiarities of ocean currents undoubtedly raise engineering problems, but the attractions are great: no right-of-way costs, and no objections from "those who cherish scenic beauty"; the shelf is quite level compared with most onshore terrains; and the depth of the aqueduct would provide a ready hydraulic head for driving the water along it. Besides which, a structure of the size contemplated (32 ft. in diameter) "might constitute an artificial presence of no small environmental and economic benefit. . . . It is a fact of marine biology that man-made structures offshore exert a profound attraction to fishes."

(This point echoes a suggestion emanating from cooperative studies by the Goodyear Tire and Rubber Co. and the Bureau of Sport Fisheries and Wildlife—that used tires should be piled up into offshore reefs from Maine to Florida. The Bureau's Richard B. Stone has reported experiments with sunken tires, showing that a variety of fish are attracted by the smaller life-forms that congregate upon and around them.)

Preliminary research on how to fix the pipes to the sea-bed has been done by Litton Systems. The currently favored approach is to have the pipe buoyant, and held to a series of anchors by tensile struts capable of swinging under the action of currents. Installation, monitoring, and maintenance would provide outlets for much advanced submarine technology and relatively recent electronics, it would appear.

The Non-Study of Fire

"We are still putting out fires the way cave men did," Howard W. Emmons, Abbott and James Lawrence Professor of Engineering and Applied Physics at Harvard University, told a Research and Development Safety Symposium of the American Society of Safety Engineers in Cambridge this spring.

We calculate the strength of the materials we use for buildings quite precisely, setting up in the laboratory conditions which will accurately duplicate those in the structure. But we only test the individual materials for flammability one by one, and what we learn in a single test of a single material is not enough to tell us how the entire system will perform. We do not ask how the materials will be used—in tension or torsion—and with what other materials. (For example, said Dr. Emmons, no part of the ill-fated Apollo capsule in which three astronauts died in 1968 would burn at a rate of over 2 in./min.—ignited from the top and burning down.)

Another example: modern building ventilating systems

present new problems; smoke from even a small fire in one part of the building can be circulated to an entirely different part of the building. Complex as it is, a problem of this kind could easily be analyzed by computer before a building is built—if we took the trouble.

Fire detection presents more fundamental problems. Simply basing the assumption of fire on the presence of heat is not enough; we need detectors that tell us something about what has been detected—whether the fire is burning paper or electric insulation, how hot it is, exactly where it is. Though Dr. Emmons called sprinklers “the greatest invention of all time for fire protection,” they do not help us as much as they should; the heat that triggers a sprinkler may have flowed across a ceiling far from the flames, and it is for reasons like this that half of today’s fire insurance claims are for damage from water, not fire.

All we need, Dr. Emmons told the safety engineers, is the foresight to do our research before we need its results. “The man on the fifteenth-floor parapet isn’t going to negotiate a contract,” he said.

The Oceanographer’s Complaint

“The scientist finds that there is something Kafka-like in his relationship to programs like the (U.S.) National Data Buoy Project and the (U.N.) Integrated Global Ocean Station System. They do not appear to be aimed at any clearly defined scientific problem; nevertheless, the scientist finds himself incessantly being asked to ‘identify’ scientific problems related to the design and use of systems for the monitoring and prediction of ocean conditions and to provide advice, often in a fairly detailed way, on many questions that seem so premature, or so poorly posed, that they reveal a deep underlying ignorance of how scientific work is conducted.

“For example, one questionnaire asks the scientist: ‘At what depths should temperature and salinity be measured? and with what precision? How frequently should these observations be made?’ Surely the answer depends on the particular phenomenon that is being investigated. . . . There is no one answer to questions like these.”

So writes Dr. Henry Stommel, M.I.T. Professor of Oceanography, in *Science* (Vol. 168, pp. 1531-1537). Professor Stommel examines the major current plans and proposals for ocean research from the point of view of the physical oceanographer, whose chief concern is “to understand the actual hydrodynamical mechanisms at work and the ways in which they interact through the range of space and time scales found in the ocean.” The kind of program that such a goal implies was well understood by the Stratton Commission, he finds (with particular reference to the Commission’s *Science and Environment* panel reports). On the other hand, the *Federal Planning Guide for Marine Environment Pre-*

diction, by the Interagency Commission on Marine Science, Engineering and Resources, is—for one thing—misleading, according to Professor Stommel, in that it carries the implication that the behavior of the ocean has already been modelled well enough to make “prediction” possible. The interagency report details budgets up to 1975 for various ocean projects, one of the most heavily budgeted being the National Data Buoy Project. “Unless some very definite provision is made to wed projects such as the National Data Buoy Project to the (Stratton) Commission’s recommendation for ‘a series of systematic investigations into the oceans’ current systems to study their dynamics . . . ,’ technological equipment such as buoys may be largely tied up in routine weather forecasting and be unavailable, or inappropriately designed and located, for basic ocean research.”

A coherent program for expanded scientific work is to be found, says Dr. Stommel, in the “Two Fluids” chapter of *An Oceanic Quest*, a report published by a joint committee of the National Academies of Science and of Engineering. From a fairly detailed consideration of some initial ocean-measurement programs suggested in this report, Professor Stommel draws the moral that real oceanography is more expensive than has been generally realized. A quite modest attempt to comprehend the dynamics of one of the regions of upwelling (off the coast of California) might require 50 or more buoys over a two-year period. Considering that the Woods Hole Institution expends \$500,000 a year on a project centered about a single mooring site south of Long Island, it seems evident that even a limited upwelling study “would strain the capabilities and resources of the oceanographic community” as regards both funds and administrative machinery.

Ocean science can derive very little benefit from sharing the data from systems developed for other purposes. “Some carefully designed measurement programs are going to be needed—on a scale larger than an oceanographic institution can manage but smaller than the space program. To be useful scientifically, these programs will have to give first priority to questions of hydrodynamics. To date,” Professor Stommel concludes, “there is little indication that they will do so.” He finds, however, that certain Russian developments are more promising: “they provide the basis for . . . a truly significant international experiment.”

Fires don't just happen. They're caused.

Fires have no sense of timing. People say they just happen.

But somewhere there's a cause. Carelessness. Or ignorance. Or apathy.

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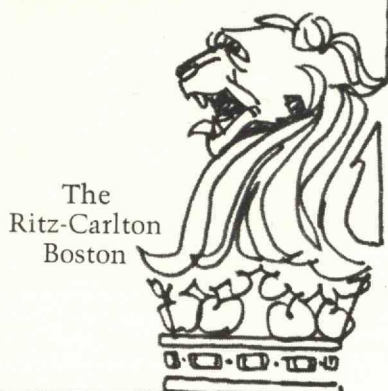
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There are
harassed travelers
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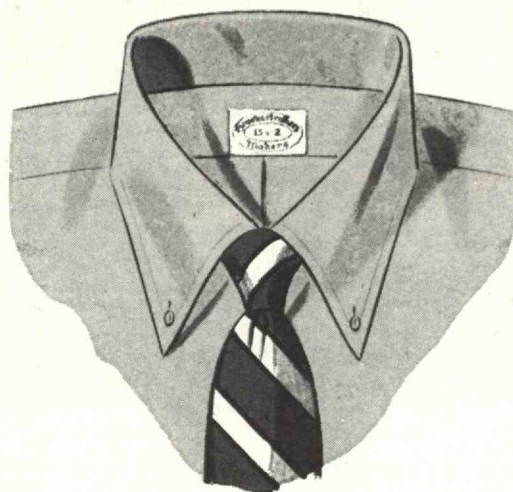


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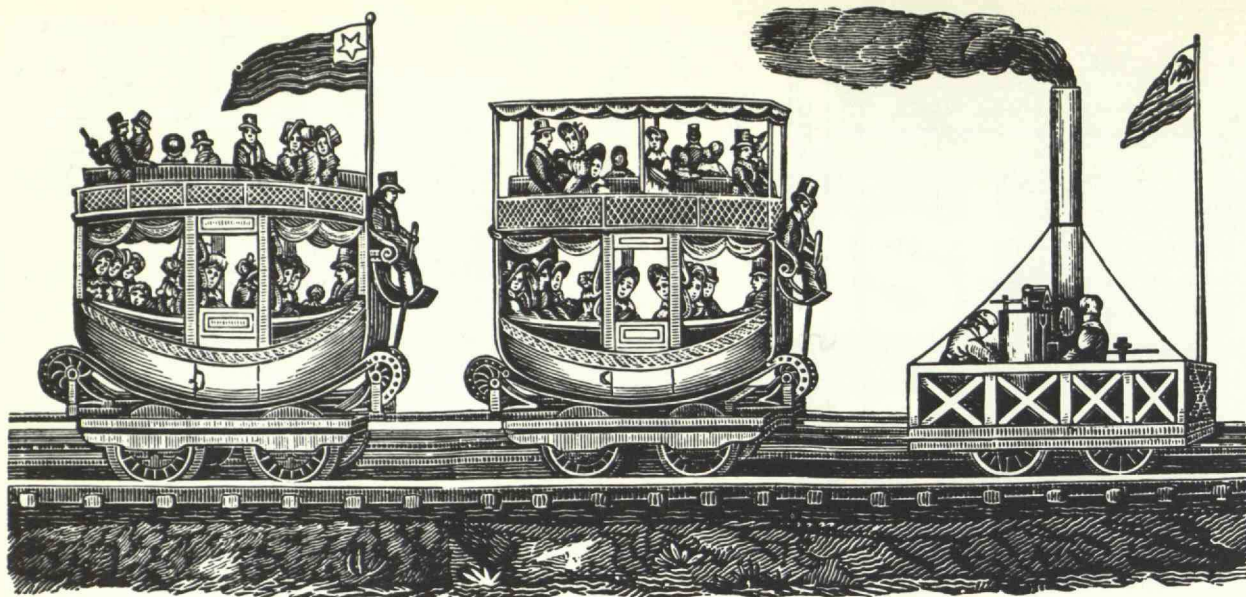
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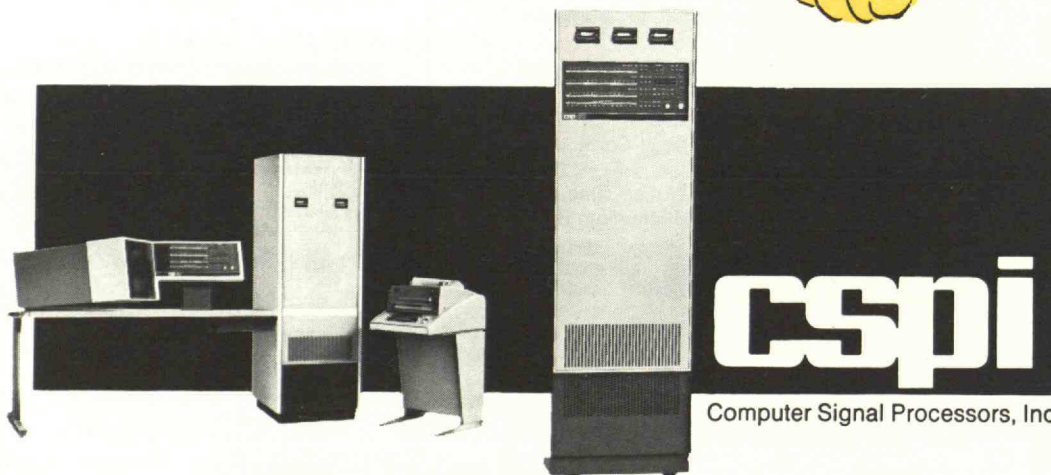
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Aspiring to Involvement

Is there no role (*see right*) for the Joint Center for Urban Studies of M.I.T. and Harvard and similar efforts to bring university research and teaching to bear on urban problems?

After a decade of effort (one of the speakers at the Joint Center's tenth anniversary symposium this summer called it "the first, tallest, and by far the most productive urban research center in the world") the Joint Center has in fact a series of new goals—and a serious shortage of funds.

One year ago, Robert C. Wood—who is now about to become President of the University of Massachusetts—listed in his first report as Director of the Center a series of new steps which would give it a focus of staff and resources and a systematic research program of its own. Among his proposals: a research survey capability (which it has now acquired through the first Boston Area Survey—*see page 78*) and urban data bank; a staff of professional and technical manpower; research drawing on the combined resources of Harvard's professional schools and M.I.T.'s technological laboratories in such fields as urban family structure, health delivery and information systems, public safety and other urban communication networks, and new communities; and a series of seminars and guest associate appointments to link the Center with various urban constituencies.

Already the Center—for lack of staff and funds—has turned down a number of research and consulting opportunities "which could in some way advance the state of the art," Professor Wood said in his report. Among them: a church-sponsored request for help in designing and evaluating a program of low-income housing; a computer system for case records for a group of public and private social agencies serving a poverty area in Boston; and a review of corporate giving policies as they affect urban affairs.

These requests were turned down because the Center could not find Harvard or M.I.T. faculty talent interested in

Agenda for Urban Research

The real problems for urban research are not pollution, crime, transportation, aesthetics, housing, and waste disposal. The real problems are social issues, said Anthony Downs of the Real Estate Research Corporation early this summer at a symposium on "The Role of University-Based Urban Centers" sponsored on the occasion of its tenth anniversary by the Joint Center for Urban Studies of Harvard and M.I.T.

Mr. Downs listed three basic social issues "which I conceive to be our most serious problems, and most in need of further research":

1. The problem of institutional change—"the well-known gap between the rate at which technological change occurs in our society and the rate at which social, legal, political, and administrative institutions change in adaptation."
2. The problem of how individual and social values are formed and stimulated, how diverse they are, and how much diversity is appropriate in our society.
3. The persistence of serious economic, social, political, and even physical inequalities in our society, their effects and the possibilities for their resolution.

As an example of needed research on institutional change, Mr. Downs cited this question about how social change can occur: "Is it true that social values must change first, and then behavior," he asked, "or can changing behavior—such as admitting blacks to all hotels and restaurants—influence values?"

In the field of individual and social values, Mr. Downs' primary suggestion was research on the impact of modern communications. For example, he asked, "Is it true that television commercials—and other aspects of television and radio programming—stimulate the poor to want more, and be less patient with poverty, than ever before?" And what about television news concentrating on "the margins of reality—sensationalism, extremism, and the like—because those are more entertaining and get higher ratings? How does this affect our national life?"

Another question: "Does the belief that society will victimize blacks create a victimization syndrome that weakens their self-improvement efforts?"

Finally, what about our social inequalities? "I'm not contending that all, or even most, inequalities are bad," said Mr. Downs. But we need to understand better than we do, he said, who is really benefiting from and paying for public programs. We need to study the relationship between inequalities

and the mixing of social classes. And we need to devise some "alternative socially acceptable path to maturity besides college training," he said.

What kind of research will yield useful work on such questions? It must be policy-oriented, controversial, multidisciplinary, large-scale. Can universities do it? Perhaps not, said Mr. Downs. "I have always been, and still am, a total nonbeliever in the ability of universities to perform team-oriented research. The intellectual atmosphere of universities attracts individuals," he said.

working on them, and it had no staff of its own. Professor Wood's challenge to his successor as Director of the Center—yet to be named: "We need to make a better match between the work that needs to be done and the people who are available to carry it out."

... for Theorist or Active Partner?

When it comes to urban research, can the university afford—or afford not—to be an active partner in controversy, social change, and political action? Must it be simply a passive theorist, a base for free inquiry and criticism?

The latter view found a strong—if lonely—advocate at the Joint Center's tenth anniversary conference (see above) in Sam B. Warner, Jr., Professor of History at the University of Michigan: "If university urban centers cannot free themselves for uninhibited teaching and study of the city I can see no other American institution which is likely to fulfill this essential function."

Among their principal hazards, said Professor Warner, are university administrators who want to use their urban research centers "as buffers in town-gown conflicts instead of confronting their own responsibility for creating and maintaining a humane university community within the city"; businesses who "purchase center research on the private market"; mayors who use centers to "legitimize" projects they want to promote or "stall" programs they do not want to tackle; students who want to "polish their identities by some philanthropic experience in the slums or by serving as some poor man's advocate"; and faculty who use the center to finance their "personal entrepreneurial expansion."

"The way urban centers can remain independent and critical while at the same time being intensely involved in the city and its affairs," said Professor Warner, "is by ruling that all action projects—whether planning, data gathering for outside agencies, designing, or consulting—be undertaken without the center, beyond the sponsorship of the university." An urban center, he said, should be managed so that students and faculty will "sustain both relevance and detachment" without selling its services to anyone.

Is this formula too sterile? Most of those attending the conference, which was made possible by a Ford Foundation grant, thought so.

Joel L. Fleishman, Yale's Associate Provost for Urban Studies and Programs, speaking at the same conference on "The Role of University-Based Urban Centers," called attention to the need for practice as well as theory in

urban teachings for "new modes of instruction which combine action with analysis . . . to permit experience to validate theory to enlighten and shape action."

And Robert C. Wood, then Head of M.I.T.'s Department of Political Science, called attention in his first report as Director of the Joint Center (*see right*) to the Center's opportunity to fulfill "a bridge role between university and community. We expect the Center to function as a mobilizer of talent and information . . . that enhance the capabilities of both universities and selected other organizations to discharge their urban responsibilities," he wrote. "We believe the Center can and should link the resources of the urban academic community more systematically to important constituencies in the urban world at large."

Boston: Uphill with Confidence?

The "downhill" course of America's 14th largest city may have stabilized in the last years of the 1960's. Indeed, says the first report of the Boston Area Survey of the Joint Center for Urban Studies of Harvard and M.I.T. (*see above*), "the 1960's have been a time of change for Boston, and in some important respects it was a change for the better."

Needless to say the city is not without its problems, and perhaps the most difficult is the Survey's finding that there is little correlation between satisfaction with government's services (mostly high) and confidence in government's capability (mostly low).

Though it is the center of the nation's sixth largest metropolitan area, Boston itself ranks only 14th in population among U.S. cities. The 1950 U.S. Census reported Boston's "household" population (not including transients, such as college students) as 738,894; in 1969 this was down to an estimated 620,000, according to the Boston Area Survey. Meanwhile, the Census counted 3,205,000 people in the Boston Metropolitan Area in 1965.

The Survey's evidence is that the decline in Boston population, which during most of the 1960's paralleled similar declines in other U.S. central cities, "halted and in all probability reversed itself to some degree" after 1965. The number of vacant housing units (8 per cent) is now only slightly higher than it was in 1960. The average size of households has dropped from 3.4 to 2.9. But in those same years the proportion of families with children in Boston has increased, and children under 20 are now a slightly larger portion of the population than in 1960. People 65 or older are a smaller portion.

In 1960 about 10 per cent of Boston's population was Negro, in 1965 the United Community Services estimated that figure at 17 per cent, and now the Survey estimates (1969) 18 per cent. Its conclusion is that "the racial composition of the city seems to have stabilized."

Bringing these factors together, the Survey published this summer concludes that "in some respects Boston's population resources are richer now than they were in 1960."

Housing may be the key factor in determining who lives in the central city and who moves out. On this front, there are both encouraging signs and problems.

There has been a "dramatic change" in the cost of rental housing: "Within the city of Boston, renters—who constitute about 70 per cent of the households—are paying about 67 per cent more for their rental housing than they did in 1960," says the Survey report. In the same period the cost of living index for Boston has climbed only 27 per cent and the median family income only 33 per cent. One-third of all Boston residents are paying at least 30 per cent of income for housing—the ideal is 25 per cent—and low-income families are most seriously affected.

The most dramatic change in Boston's housing situation—and perhaps the most threatening to the stability of its population—is the 67 per cent increase in rents since 1960, according to the 1969 Boston Area Survey just completed by the Joint Center for Urban Studies of Harvard and M.I.T. As the chart shows, the burden of increasing rents falls unevenly; families with lowest total incomes pay the highest proportion of their incomes for housing, and many of them pay more than the 25 per cent which is generally recommended.

City services rate remarkably well with Boston residents. Fully 80 per cent say trash and garbage collection are "very good"; 57 per cent say the same of police, 55 per cent of schools, 35 per cent of parks and playgrounds.

But there are problems here, too. Despite their praise for its services, only 30 per cent of Boston residents gave "very good" or "good" ratings to the city government. Two-thirds of both Irish and Italians in Boston feel that the city government is most concerned about helping Negroes, while only 20 per cent of the Negroes think so; indeed, 50 per cent of the Negroes complain that the city is "least concerned" about helping them.

The Survey believes these findings—that most people berate the city government despite approving many of its services and believe it more concerned about helping someone else—are "central to the problems that any city government must face. . . . Providing services . . . even at a very satisfactory level does not necessarily win the backing of the community."

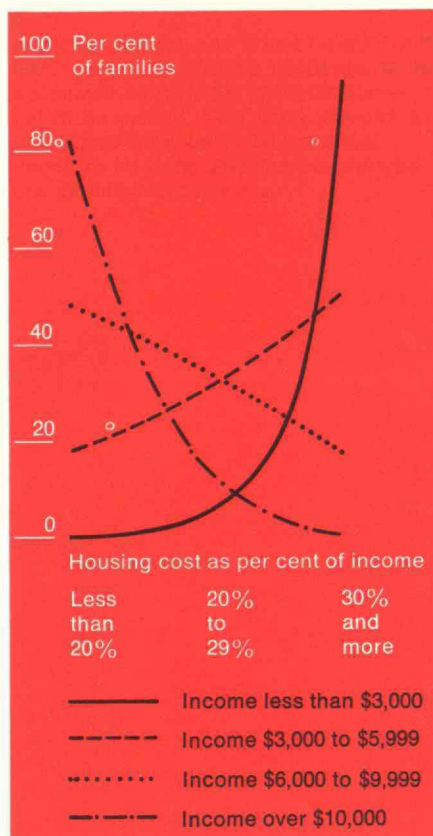
The 1969 Boston Area Survey was based on intensive interviews with over 500 residents, preselected so that each household in Boston had the same chance of being included. If such a sampling is done carefully, says Floyd J. Fowler, Jr., Assistant Director of the Joint Center's new Survey Research Program, it is indeed possible to describe accurately a population of 600,000 after talking with only 0.1 per cent of them.

Pennsylvania Reinterpreted

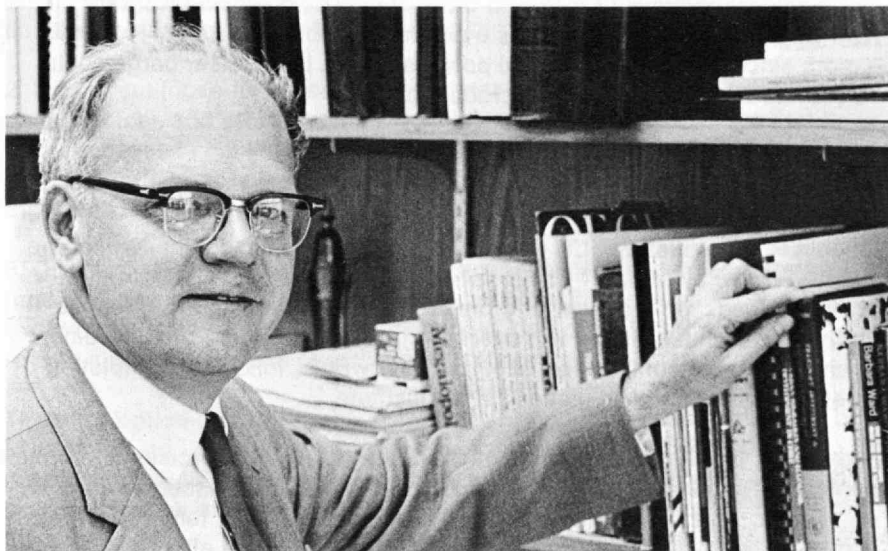
The Pennsylvania law designed to limit financial aid from that state to students involved in campus disruptions and certain misdemeanors has been reinterpreted (see *Technology Review* for July/August, p. 67). The new interpretation, which preserves the principles of university independence in administering education and discipline, has now made it possible for M.I.T.—which refused to accept the legal obligations of the original Pennsylvania act—to modify its stand.

By the original interpretation, the law required reports by the university itself on all guilty students from Pennsylvania, whether or not they were receiving financial aid under that state's liberal programs; once so reported, any student would probably become ineligible for funds from Pennsylvania. The noncomplying colleges complained that the act took away their control of how much punishment should be meted out to whom and also placed the college in the role of "informer" to the state about its students.

Under the revised interpretation, the student—not the institution at which he is enrolled—must report court or campus disciplinary actions which fall within the Pennsylvania law, and the college is responsible for verifying the answers with the student's explicit consent. And no student need comply unless he is receiving, or wishes to receive, a scholarship or loan under the Pennsylvania program.



N.E.C.A.P. stands for New England Coastal Area Planning—the latest in a series of systems engineering experiences for Greater Boston students organized under the leadership of William W. Seifert, Professor of Engineering in the M.I.T. Departments of Civil and Electrical Engineering. The point is to explore all sides of large problems in which engineering will have a central role; hence the involvement of law, economics, and mathematics students—as well as the engineering students who would be expected. (Photo: Donald L. Estes)



Project N.E.C.A.P.

How can engineering education involve students—who usually study one topic in depth at a time—in the wide range of issues in which real-life engineering projects are enmeshed? For example, how can it teach strategies of trade-offs among engineering, economics, and conservation?

One answer is a systems engineering effort conducted every spring under the direction of William W. Seifert, Professor of Civil and Electrical Engineering and Director of Project Transport at M.I.T. It aims each year to provide students with the experience of tackling a topic "having broad technical and social implications," to use Professor Seifert's phrase. This year's was the same, only more so: to develop principles for regional planning in the New England Coastal Area.

The 17 students—who combined six engineering disciplines plus law and economics—identified major problem areas, narrowed down on the critical needs of each, decided on focal points for study, and, finally, recommended a plan for action. The general goal was assumed as: an improvement in the quality of life in a region characterized by dense population and the associated problems of pollution, congestion, and increasing recreational needs. Focal points for special study proved to be: power generation, development of Boston Harbor to enhance the region's recreational value (recreation being the region's second largest source of income), pollution control, the development of new city areas away from the present metropolitan centers, and the restructuring of land use and taxation under a new regional government body.

It was this last idea—restructuring of government—which drew concentrated fire from governmental experts who came to hear the students present their results this spring; the students found themselves being treated as serious political planners, rather than volunteers for a one-semester educational experiment.

To take one example of the group's thinking: Industrial electric power costs 25 per cent more in New England than in the country as a whole, and to the private consumer it is even more expensive. The shoreline should be preserved for recreation, and yet the ocean is needed as a heat-sink for more power plants to lower the cost of energy. So the team arrived at the idea of the floating power station—a fast-breeder reactor and two 1,250-MW turbine units mounted on a 1,000-foot barge displacing 120,000 tons. The barge would be moored perhaps three miles offshore.

Points in favor of the floating station, according to the students: the barge would be inexpensive to build; pollution control would be simple; construction would be relatively rapid; and the system would provide work for New England shipyards. There is even the possibility of a new regional export, since, unlike conventional power stations, the nuclear barge could be standardized and even mass produced.

After Vietnam, What?

Lincoln P. Bloomfield, M.I.T. Professor of Political Science, thinks that the "post-Vietnam syndrome" could now be a major hurdle in U.S. foreign policy. Indeed, "only a clear and present danger involving the direct security of the United States will override growing U.S. fears of involvement in another 'local conflict' like Vietnam," he writes, following completion of a new series of "political games" at the Institute.

As a result of their observations of CONEX—"political exercises on conflict control"—Professor Bloomfield and his associates are concerned that Americans, rejecting unilateral military intervention, may tend "to retreat into hand-wringing rather than searching for imaginative alternatives" for national policy. All his recent games, says Professor Bloomfield, "underscore the chronic difficulty the U.S. may experience, once it decides not to use its own military forces, in deciding on any purposeful action whatsoever." Military and international games such as CONEX are a new development (attributed largely to Professor Bloomfield and his colleagues in the M.I.T. Center for International Studies) in which political scientists and government officials are given a hypothetical but plausible set of international political and military conditions and then play out their moves and counter-moves much in the manner of an elaborate game of chess. The CONEX series of four games, by far the most extensive attempted by the M.I.T. group, was part of a study of international conflict sponsored by the U.S. Arms Control and Disarmament Agency.

One striking result of the CONEX games was to dramatize what Professor Bloomfield calls "a persistent tendency inherent in some local conflict situations for the U.S. to be drawn in" against its better judgment; this sometimes happens because of allies who have "territorial ambitions which U.S. aid helps them to satisfy."

But not all such situations are bad. There is massive historical evidence, says Professor Bloomfield, that "there are occasions when, in the absence of an effective system of collective security, the need exists for a great power to counterbalance an aggressive or expansionist power" in order to maintain a larger peace. Indeed, he writes, "by itself, a strategy of nonintervention does not add up to a creative or dynamic policy, either in games or in real life. . . . Some turbulence in the short run may be the only assurance of a longer-term stability in today's world." The United States' toughest future problem "may well be to have the courage and the will to act when it is not only appropriate but indispensable to do so."

On Quantifying the Incommensurables

Man is making for himself what Elting Morison, Master of Timothy Dwight College at Yale University, calls "an almost totally artificial environment which is replacing the natural environment." Thus, he has "ceased to be in the position of Job struggling to deal with an almighty God; we have arrived at that power of God."

The modern technological institution balancing itself between emphasis upon theory—science—and practice—engineering—now has three choices in its response to these changing conditions, Professor Morison told the Commission on M.I.T. Education late in the spring:

1. It can let its course be set by the inertial forces upon it—"tension between theory and practice and concern for the outside world"—letting the institution evolve and multiply its infinite variety and its size.
2. It can "cut loose from pedagogical responsibility, forget the educational, philosophical, and ethical concerns which ordinarily go with ideas that have consequences . . . and make itself into a general, all-purpose laboratory for the twenty-first and twenty-second centuries, serving society by force-feeding it with ideas and applications."
3. Or it can attempt to use its specific capabilities in science and engineering "as a base from which to extend its definitions of what it . . . and the world ought to be like, and in addition what kind of people it ought to educate to take a responsible and effective part in that world."

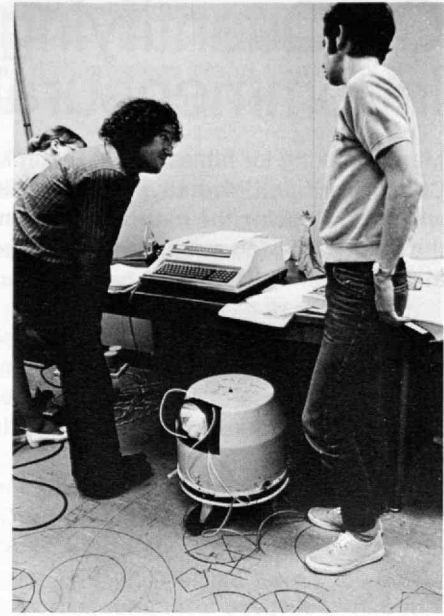
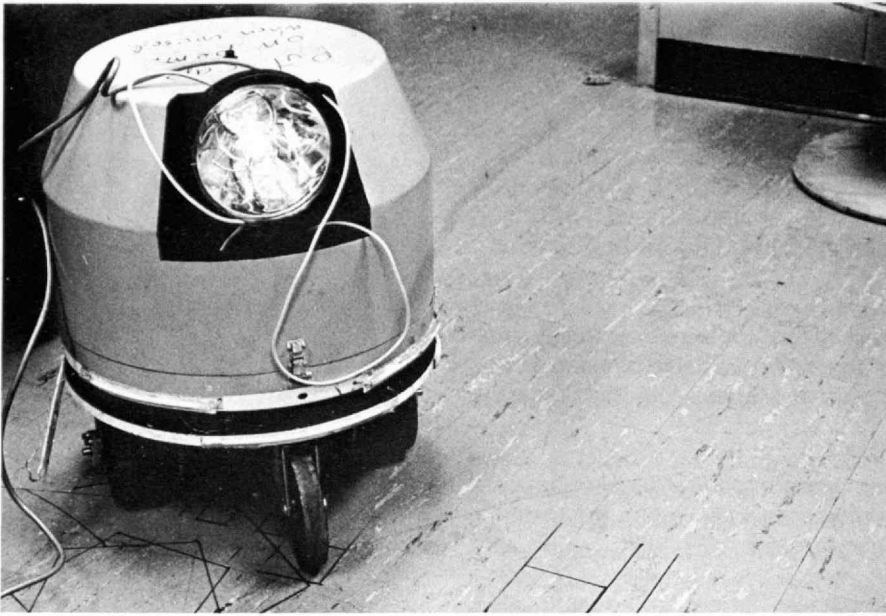
The third option—which obviously most intrigued Professor Morison—presents some "very real" problems, he told the Commission: how to develop from science and engineering a general concern for the way the world should be organized, how to develop a sensitive exchange between the "two cultures" . . . "a general sympathy for all kinds of speculation and discovery, a belief that all knowledge has a kind of civilizing part to play.

"The ability to establish connections between different kinds of data (the hardest thing to do) is the product of a good general education. It is extremely valuable as a background for thinking about how to organize the variables and the apparently disparate elements in the world as a whole."

Eric L. Mollo-Christensen, Professor of Meteorology who is a member of the Commission, asked Professor Morison: "Is there a way to teach so that people learn, not what the variables are, but rather the way in which one tries to decide what the variables are?"

For his answer, Professor Morison recalled his experiences as a member of the Sloan School of Management faculty at M.I.T. The School sought—and found—its first-rate minds by looking in first-rate disciplines. "Yet it is not at all clear to me," he recalled, "that the teachers obtained by this process were particularly interested in the management of industry. Once you are trained in the business of quantitative analysis, you naturally tend to exclude every variable that you cannot measure and analyze.

"When you've got quantifiable units, the elegance of the operation, intellectually, is irresistible. You're always going to go for that, rather than for the sloppy, messy stuff introduced by the incommensurables, of which human beings are some of the most important. This is one of the things that really worries me about the progress of intellectual life in this society: that more and more as we find we can do certain things in the social areas with quantifiable data, we will tend to exclude considerations about the human condition because they are not quantifiable."



Teaching Children Thinking

All school subjects demand that a child think, yet nowhere in our present educational system is thinking taught. In fact, "Pop Ed" theory suggests that if a child thinks about thinking he will not be able to do it. Seymour A. Papert, Professor of Applied Mathematics and Associate Director of the Artificial Intelligence Laboratory at M.I.T., disagrees. He maintains the core skill of thinking must be taught and that computer technology can be successfully used to do it.

At a one-day conference at M.I.T. this spring, Dr. Papert and his colleague, Marvin L. Minsky, Professor of Electrical Engineering, described an educational system designed from the foundation up to use the power of modern techniques to an overflow audience. Technology in education usually means new gadgets to teach the same old stuff. Professor Papert observes that teaching machines are exciting mostly for those who invent them. So in Dr. Papert's vision of education children design their own teaching programs on the computer.

The computer offers real advantages in teaching children thinking. The student at the terminal can work through a project in which he sets his own goals and conquers whatever "bugs" come up on the way. In the course of proving out his own notions, the student tastes the joys and frustrations of research and discovery. A child senses personal triumph when he makes his own program work in his own way.

One teaching experiment has been conducted by Professor Papert in a local school. Seventh graders, not chosen for particular aptitude or achievement, were given access to computer terminals—one for every two children—four hours a week or more for the whole school year. Conversing in LOGO, a computer language designed for children, students built language-generating programs including some in French and a variety of computational programs.

As a result of this experiment, Dr. Papert wants to set up a school, the core of which will be computer-aided teaching. His present limited experience has made clear the problem of overdependence on the "computer culture" as a context for showing the child how to teach himself by using machines. Debugging of his concepts, Dr. Papert feels, requires working within a school context over a number of years, so that there can be measurement of the children's performance and the opportunity to introduce and test a variety of computer-aided thinking programs.—*Helen Ingram*

Happiness—and learning—for a child can be the act of punching a computer console, so argues Seymour A. Papert, originator of the "turtle" shown above. A mathematician and a former associate of child psychologist Jean Piaget, Professor Papert (above, on the left) is shown in the M.I.T. Artificial Intelligence Laboratory, with a student, checking the progress of a program which guides the turtle about the floor and makes it spell such words as "HI." The educational value of the turtle is to stimulate the children's interest in programming the computer and, he says, to teach them how to think.

Science Is Still the Instrument

"One can only conclude that science—fundamental biological and physical science—can make relatively little contribution" to the major and primarily social problems which face our nation, "and for that reason, in the competition for national resources, science is likely to be placed on the back burner . . . for some years."

Dr. Philip Handler, president of the National Academy of Sciences, proposed to the Federation of American Societies for Experimental Biology recently that the pause be used to order the mechanics of science, by the formation of a federal agency for research and higher education directed by a secretary of cabinet level.

He suggested that the agency combine the National Science Foundation, the Endowment for the Humanities, the proposed Foundation for Higher Education, the Bureau of Higher Education, and some elements of N.I.H., A.E.C., N.A.S.A., and perhaps of the Department of Defense.

Rather than the present system, under which the "mission agencies" support most research and the N.S.F. is trusted to fill the holes, "such a new agency could plan and operate an orderly system of support, not as a haphazard patchwork, but as a continuum which provides specifically for the needs of institutions, departments, investigators, and students," he said. Such an agency could set priorities for research, within and among various disciplines, "an exercise which, to date, has completely defeated us," and which now rests basically with the Bureau of the Budget. By describing a sort of national science policy, the agency could better present to the Congress and the people the concepts of what science does and how it works. It could recreate the failing public belief in what science and education can give to the improvement of man's lot.

Dr. Handler suggested several new patterns of funding. Since graduate and professional schools now have national rather than local constituencies, their support should be national and the proposed agency would disburse bulk funds for research and education both. "In the university setting, the research and educational endeavors cannot rationally be separated," he said. The quality of each affects the other. Individual grants would also be awarded, judged as today by juries of peers. But their support would be assured for several years, "conditioned only by reasonable progress."

Departmental grants might also be common, "funds for graduate and medical student stipends, communally used equipment, and modest unrestricted funds for the research of newly appointed faculty . . . for the first two or three years of one's appointment." Training grants for multidisciplinary programs, he suggests, "could be a remarkable catalyst to such endeavors."

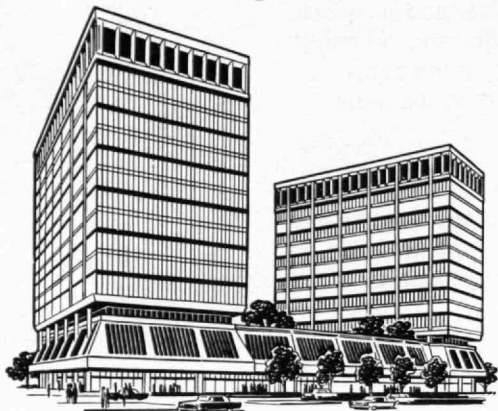
A combined agency, Dr. Handler feels, would justify its own congressional committees and be a source of political identification and pride among its sponsors.

An agency for science and higher education might also catalyze a blending of science and humanism. Their separation is presently emphasized by separate paths of support. Yet, "one of the greatest present needs is to bring together the scientific and humanistic enterprises so that scientific discovery in the future will take place within the context of humanistic thought. . . .

"The old disciplinary names . . . have lost their meaning as the universe, from molecule to man to society to cosmos, becomes understandable as a single continuum. New alignments . . . new insights are required." And competent, coherent support for all of man's studies, and encouragement of their relationships, might help us sort out what is valuable "while there is still time—if there is still time."

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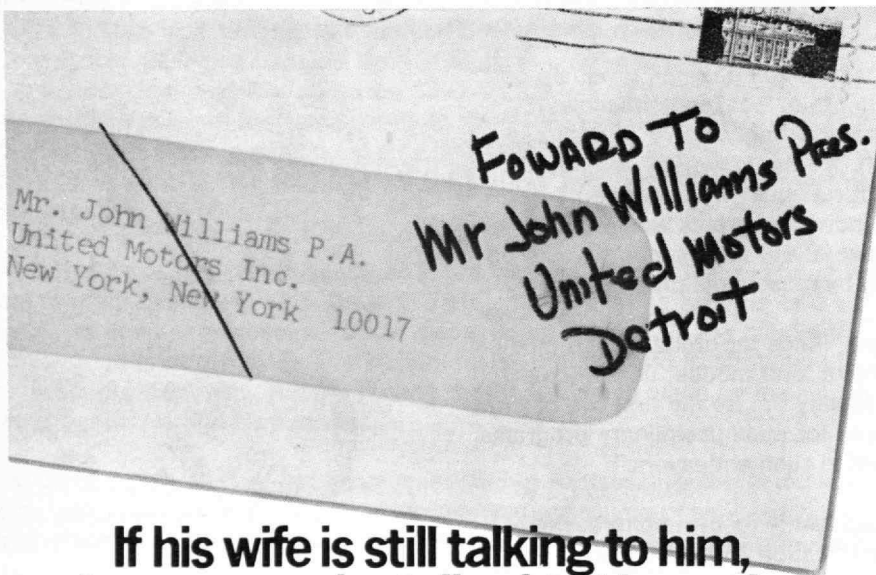
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Five Problems, Three Corrections

Hi. Since this column starts a new volume of *Technology Review*, let me briefly mention the ground rules for the benefit of new readers.

In each issue we'll publish five problems and two "speed" problems, selected from those submitted by readers. Three months later we'll publish an answer—as received from a reader—to each problem; but normally the "speed" problems remain unanswered.

Thus the column depends on reader response. None of the problems or solutions is mine, so all the credit (and blame) belongs to all of you out there in magazineland. As of now (August 13) I have a backlog of proposed problems which will last almost until the snow melts, so please be patient if your masterpieces don't appear for a while. "Speed" problems, on the other hand, are in short supply.

Before getting to the problems, let me clear up three points from previous columns. First, the magic punctuation is John when James had had "had had" had had "had" "had had" had had the teacher's approval. Apparently John shouldn't have changed James' "had had" to a mere "had." Second, while very pressed for time last spring I offered a lifetime subscription for anyone who could separate my sunsets by 42 hours. Since then many people have suggested that I go into earth orbit. Although this would surely solve the solid waste problem at my mother's house, I am not giving credit; the obvious intent of the problem was to increase my working hours. Finally, in the July/August issue I gave Gauss credit for proving the impossibility of constructing certain polygons with straight edge and compass. Michael Goldberg has pointed out my error and refers interested readers to the *American Mathematical Monthly*, Volume 75 (1968), p. 647.

Problems

We start the volume off right with a bridge problem from Winslow H. Hartford:

1 Given the following hands, with the contract four spades:

♠ x x x x	♠ x
♥ A K Q J x	♥ x
♦ x x x	♦ K J 10 x x x
♣ x	♣ x x x x x

♠ A K Q J 10
♥ x x
♦ Q x
♣ J x x x

West leads ♥K and ♥J and continues with ♥Q (his best play). Can you make the contract?

Frank Rubin submits the following:

2 Let N be some fixed positive integer. Show that there exist positive rational numbers a_1, \dots, a_N such that for any $m, 1 \leq m \leq N$

$$S(m) = \sum_{i=1}^m a_i^3$$

is the square of a rational number, and $S(N) = 1$.

Here's an interesting problem from Douglas J. Hoylman:

3 Pascal's triangle can also be written in rectangular form, in which case it looks like this:

1	1	1	1	1	...
1	2	3	4	5	...
1	3	6	10	15	...
1	4	10	20	35	...
:	:	:	:	:	:

The first row and first column consist entirely of 1's and the other entries are found by adding the number to the left and the number above. If this array is continued to n rows and n columns, where n is any positive integer, prove that the determinant of the resulting matrix is 1.

Here is some magic from David DeWan:

4 A magic square is a square matrix of numbers such that rows, columns, and diagonals all sum to the same total. Create a 5×5 magic square using 25 two-digit numbers composed of the digits 0, 1, 6, 8, and 9. The magic square must also work when turned upside-down (90 becomes 06, etc.).

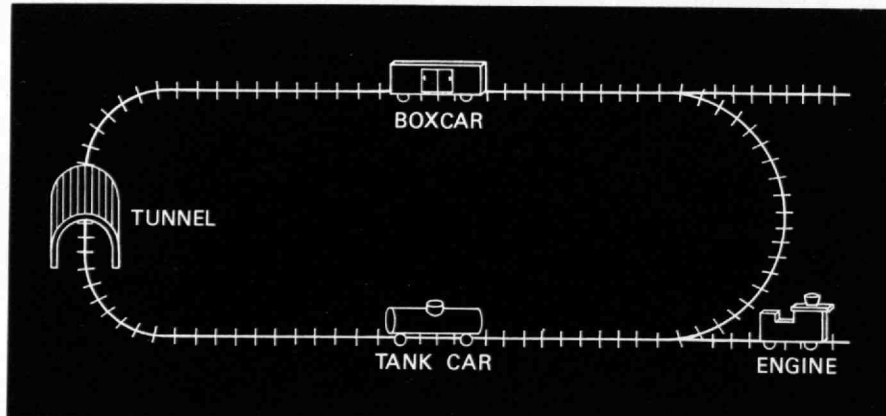
Smith D. Turner writes:

5 Determine a rational number whose square, when increased or decreased by 5, is still a square.

Speed Department

Donald F. Morrison figures the Penn Central needs some help:

SD1 On the railroad below, the tank car and boxcar can be pushed or pulled, singly or in tandem, but cannot move on their own. Only the engine can pass through the tunnel; the other two cars are too large. The problem is to interchange the tank car and boxcar and end up with the engine on the same siding it started on.



Frank Rubin proposes the following:

SD2 Arrange three points within a unit square so as to maximize the minimum between two of them.

Solutions

This month's solutions are to problems published in the May, 1970, issue of *Technology Review*.

31 The number 1,729 is an "interesting" number because it is the first number which is the sum of two positive cubes. Solve the corresponding problem for squares, fourth powers, and fifth powers.

Judith Q. Longyear writes:

Presumably what is wanted is the first number which can be written in two different ways as the sum of k powers; otherwise $2 = 1^k + 1^k$ solves all of them. If either of the proposers has the solution for $k = 5$, any journal on number theory or diophantine analysis will enjoy publishing it.

$$1^1 + 3^1 = 2^1 + 2^1 = 4$$

$$1^2 + 7^2 = 5^2 + 5^2 = 50$$

$$1^3 + 12^3 = 9^3 + 10^3 = 1,729$$

$$134^4 + 133^4 = 158^4 + 59^4 = 635,318,657$$

William Ackerman, Michael Rolfe, R. Robinson Rowe, and Samuel S. Wagstaff, Jr., the proposer, also responded.

32 In a league of $2n$ teams, each team plays every other team exactly once during a season. What is the greatest possible number of teams that can have a winning season? (Assume no ties.)

The following is from Robert Lack: The answer is $2n - 1$ teams. In a league of $2n$ teams, each team would play $2n - 1$ games (under the conditions specified). In order for a maximum number of teams to have a winning record, $2n - 1$ teams would have records of n games won and $n - 1$ games lost, while one team would have a record of no games won and $2n - 1$ games lost. This works out in all cases because if $2n - 1$ teams have each $+1$ in the won column (one more game won than lost), this equals $+2n - 1$ in the won column total. To balance this, one team has $+2n - 1$ in the lost column and 0 in the won column. (The total games won and lost for

all $2n$ teams must be equal.) To demonstrate this, let $n = 3$ or six teams. At best, 5—or $2n - 1$ —teams can have a winning record:

Won	Lost	or	Won	Lost
3	2		n	$n - 1$
3	2		n	$n - 1$
3	2		n	$n - 1$
3	2		n	$n - 1$
3	2		n	$n - 1$
0	5		0	$2n - 1$
15	15		$5n$	$7n - 6$

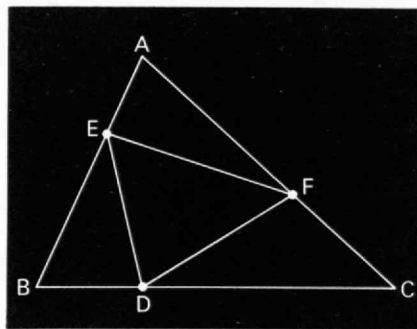
Since $-6 = -2n$, $7n - 6 = 5n$.

Therefore, in a league of $2n$ teams (under the conditions specified) a maximum of $2n - 1$ teams can have a winning season.

Also solved by William Ackerman, Daniel S. Diamond, James W. Dodson, Donald Forman, Winslow H. Hartford, Leon M. Kaatz, Judith Q. Longyear, Donald F. Morrison, John E. Prussing, R. Robinson Rowe, Frank Rubin, Les Servi, and the proposer, Douglas J. Hoylman.

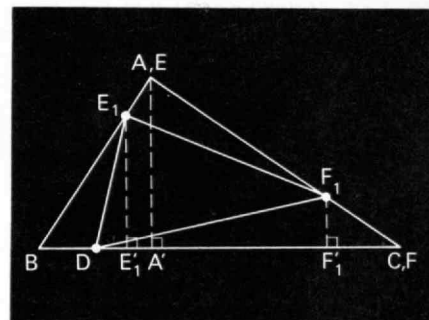
33 Given any triangle ABC and a point D on segment BC, find (without using calculus) points E on AC and F on AB such that triangle DEF has maximum area.

I hate to keep appealing to Frank Rubin, but all other responses were either incomplete or nearly illegible. Here is Mr. Rubin's:



Answer: If $BD \leq DC$, then choose $E = A$, $F = C$; if $BD \geq DC$, then choose $E = B$, $F = A$. (Note that when $BD = DC$, there are two equally good choices). For proof, we will consider only the case where $BD \leq DC$. Then the area of $\triangle DEF = AA' \cdot DC$. Suppose we chose

some other $\triangle DE_1F_1$, then if $F_1F_1' \leq E_1E_1'$, $A(DE_1F_1) \leq A(DE_1F) = E_1E_1' \cdot DC \leq AA' \cdot DC = A(DEF)$, with equality maintained only when $E_1 = E$ and $F_1 = F$. On the other hand, if $F_1F_1' > E_1E_1'$, then we have by the same argument $A(DE_1F_1) \leq A(DBF_1) \leq A(DBA) < A(DEF)$. This proves that the choice $E = A$ and $F = C$ is maximum when $BD \leq DC$, and the argument for $BD \geq DC$ is the same.



William Ackerman, John E. Prussing, and Michael Rolle also responded.

34 A census taker stops at a house, notes down the number on the door, and knocks. When a woman answers, he asks her age and notes the answer. Then he asks if anyone else lives at the house; she replies that three other people live there. Upon asking their ages, he is given the reply that the sum of their ages equals the number on the door and their product equals 1,296. He does some quick computation and then asks if the oldest of the three is older than the woman to whom he is talking. She replies that the oldest is younger than she. What are the ages of the three? What is the house number?

James P. Friend notes:

Of all the possible triple factorizations of 1,296, only two have the same sum: 2, 8, 81 and 1, 18, 72. The census taker knew the house number was 91, and he knew the above factorizations. Obviously the woman answering the questions was between 72 and 81 years of age (assuming an 18-year-old does not qualify as a woman). Since the oldest of the three other residents was younger than the woman answering the question, the ages of the three residents are 1, 18, and 72. (The assumption of an 18-year-old not

being a woman may be dubious if she is the mother of the one-year-old.)

Also solved by High C. Barrett, Richard S. Galik, Woodrow M. Hazel, R. Robinson Rowe, and Frank Rubin.

35 Given the following hand, with the bidding as indicated, show how the declarer can take 11 tricks, assuming the diamond finesse must be successful.

♠ 8 4 2	♠ J 10
♥ A 6 5	♥ 9 3 2
♦ Q J 9 8	♦ K 7 6 5 4 3 2
♣ K 8 7	♣ 9
♠ A Q 9 6 3	♠ K 7 5
♥ K Q J 10 8 7	♥ 4
♦ —	♦ A 10
♣ 10 3	♣ A Q J 6 5 4 2

The bidding: South—one club, West—double, North—redouble, East—one diamond; South—three clubs, West—four hearts, North five clubs, East—pass. West opens with ♠K.

Rex Ingraham solved all the problems involved—including some that were not intended; he proposes three of the latter: What card did West lead, really? Who goofed, and why? Why did Warren Himmelberger, the proposer, guarantee the diamond finesse?

In last-things-first-order: If Warren Himmelberger didn't mean to cue the solution he must have meant to hide it; either way I'd only fault him for the mention of the finesse because a bridge player would have to risk it on his own, anyway. It must have been a proofreader who goofed—not a bridge fan—because Allan Gottlieb certainly knows ♠K ≠ ♥K and Warren Himmelberger knows ♠K is not among West's assets. West must have opened ♥K, because of all his cards this is the only opening to present a problem which can be solved without depending on a pure guess by the declarer.

A complete solution and adequate explanation of the reasoning goes something like this, I think: West opens ♥K. The declarer considers the old common-law "Who looks ere leaps may live to leap another day" and the ancient adage, "Aces ain't always assets," sees that he will win no spade trick without a helpful lead from West, and concludes that he can well afford to duck the first trick and does so. West now has no lead which will not give the declarer 11 tricks; he has already blown the defense, although he cannot know this. If he buys the temptation, to lead a low spade (East's ♠K and diamond return could set the declarer down three or four tricks), the declarer's ♠K will actually score him an overtrick. If West opts to fill his book while sure of ♠A, then any lead to the third trick will put the declarer in to score 11 tricks. Whether at the second or third trick, the declarer can win in his own hand (the dummy would again duck any heart continuation), complete drawing trumps to the dummy's ♣K, and play ♦Q. East's temptation to cover in desperate hope to

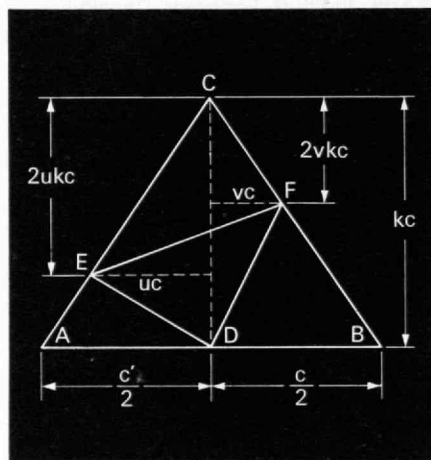
lead a spade through the declarer's weakness could prevail; if so, the declarer's ♦A will win and at once give him 11 or 12 established tricks. But when East ducks the ♦Q, so also must the declarer duck—not because Warren Himmelberger guaranteed the finesse but because its success is vital to fulfillment of the contract and practically assured by East's bid and West's repeated failure to lead any diamond. When ♦Q holds, ♦A is suddenly changed from asset to liability. But the declarer can purify his hand by stashing it beneath dummy's ♥A—and does so. Now the declarer can continue dummy's diamonds to ruff away East's ♦K, return to the dummy's ♣8, to cash any remaining diamonds, and claim his remaining trumps for 11 or 12 tricks, as the case may be.

Also solved by James W. Dodson, James P. Friend, Donald Forman, Cmdr. R. H. Gaunt, Winslow H. Hartford, Leon M. Katz, T. C. Robinson, Patrick J. Sullivan, Edmund J. Thimme, Alan B. Wright, and the proposer, Warren Himmelberger.

Better Late Than Never

13 Find conditions on the ratio of the altitude to the base of isosceles triangle ABC such that the inscribed triangle DEF with maximum area (D is at the midpoint of AB) has FE parallel to AB.

Charles S. Rall notes that the solution as published in the April, 1970, issue is incorrect. Indeed, he says, as the problem is worded there is no solution:



As was done in the published solution, let the area of DEF = A and the area of ABC = A'. In addition, let $f = (u + v - 4uv)$ and

$$\underline{x} = \begin{Bmatrix} u \\ v \end{Bmatrix}$$

so that the matrix notation may be used. As published in the solution, one has $A' = \frac{1}{2}kc^2$ and $A = (u + v - 4uv)A' = fA'$. One should note here that because $A/A' = f$ is not a function of k, the ratio of the altitude to the base cannot affect the answer, as could be seen from the published solution. Continuing,

$$\left[\frac{\partial}{\partial \underline{x}} \left(\frac{A}{A'} \right) \right]^T = \left(\frac{\partial}{\partial \underline{x}} f \right)^T = \begin{Bmatrix} 1 - 4v \\ 1 - 4u \end{Bmatrix}.$$

Equating this quantity with zero does indeed give a stationary value at

$$\underline{x} = \begin{Bmatrix} \frac{1}{4} \\ \frac{1}{4} \end{Bmatrix} = \begin{Bmatrix} u \\ v \end{Bmatrix}.$$

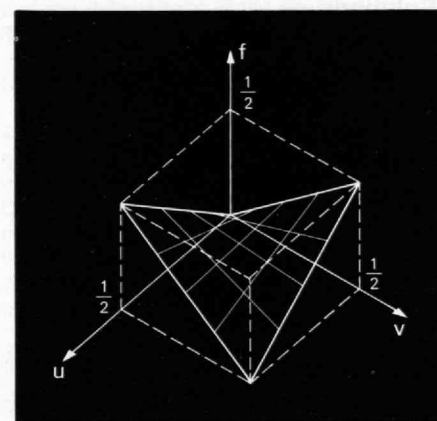
However, looking at the matrix of second derivatives,

$$\frac{\partial^2 f}{\partial \underline{x}^2} = \begin{bmatrix} 0 & -4 \\ -4 & 0 \end{bmatrix},$$

one sees that this stationary point published in the solution as a minimum is instead a saddle point. Let us look at the value of the function f over the range of permissible values for u and v, $u, v \in [0, \frac{1}{2}]$.

The permissible interval for u and v is assumed to be closed so that a maximum actually does exist. The sketch below of the value of f versus u and v in the permissible region demonstrates that there are two maxima,

$$\underline{x} = \begin{Bmatrix} 0 \\ \frac{1}{2} \end{Bmatrix} \text{ and } \underline{x} = \begin{Bmatrix} \frac{1}{2} \\ 0 \end{Bmatrix}.$$



In other words, the inscribed triangle with maximum area and with D the midpoint of AB occupies either the left half or the right half of triangle ABC and has an area of exactly one-half the area of the larger triangle. FE is not parallel to AB but is coincident with either AC or BC.

14 Find a function f defined on the entire real line such that

1. f is bounded and strictly increasing;
2. f is continuous at each point x; and
3. $\lim_{x \rightarrow -\infty} f'(x) \neq 0 \neq \lim_{x \rightarrow \infty} f'(x)$.

Two mistakes in a row; William Ackerman corrects me, writing that there is no function f defined on the reals as specified. His proof:

Since $\lim_{x \rightarrow \infty} f'(x) \neq 0$ and f is increasing,

$f'(x) \geq 0$ everywhere, and $\forall S, \exists X$ such that

$$x > X \Rightarrow |f'(x) - \lim_{y \rightarrow \infty} f'(y)| < \delta$$

$\lim_{y \rightarrow \infty} f'(y)$ must be greater than 0, so, letting

$$\delta = [\lim_{y \rightarrow \infty} f'(y)]/2,$$

$$\exists X \exists x > X \Rightarrow f'(x) > [\lim_{y \rightarrow \infty} f'(y)]/2,$$

so f(x) is bounded away from zero for $x > X$, and so f(x) grows faster than a first-degree polynomial. Specifically, by the Mean Value Theorem, $x > X =$

$f(x) - f(X) = f'(\xi)(x - X)$ for some ξ (X, x) , so
 $f(x) - f(X) > [\lim_{y \rightarrow \infty} f'(y)]/2(x - X)$.

Since f is bounded, $f(x) \leq D \forall x$, but if
 $x = \frac{[D - f(x)]}{[\lim_{y \rightarrow \infty} f'(y)]/2} + X$

then

$$D - f(X) = [\lim_{y \rightarrow \infty} f'(y)]/2(x - X).$$

Therefore $f(x) - f(X) > D - f(X)$,
 so $f(x) > D$.

The published solution correctly satisfied properties 1 and 2 (tan⁻¹, tank, and error function are other examples), but the attempt to add a discontinuity to f' at infinity failed because:

1. $f'(\infty)$ is not defined;
2. Even if it were, adding a discontinuity there would not solve the problem. The problem concerns $\lim_{x \rightarrow \infty} f'(x)$, and hence

constrains f' near ∞ , not at ∞ .

It does not matter whether the limit does or does not equal $f'(\infty)$, as long as it does not equal zero.

3. The attempt to add the discontinuity at 1 and shift 1 to ∞ by mapping $(0, 1)$ to $(0, \infty)$ would not work in any case because $1 \notin (0, 1)$ and $\infty \notin (0, \infty)$.

16 Find a curve having nonconstant radius of curvature such that all the centers of curvature lie on the x axis.

Donald E. Savage writes that R. Robinson Rowe's solution as published in May, 1970, is in error:

First, as a minor point, equation 3 is in error (by a minus sign) as one can see from either of his diagrams. For example, along the arc OU, $y > 0$, $y' > 0$, and yet $y'' < 0$. But my major criticism is of his equation 4. Differentiating both sides, I get

$$y'' = -2[\sqrt{a^4 - y^4}]/y^3$$

$$+ [y/\sqrt{a^4 - y^4}]y'.$$

Substituting for y' and then multiplying by y , I get

$$yy'' = -2a^4/y^4.$$

But $1 + y'^2 = a^4/y^4 \neq yy''$, as equation 3 requires.

Having criticized his solution, I will now make my own available for criticism:

Part I: "Nice" functions. From Burington's Tables, the y coordinate of the center of curvature corresponding to the point x, y on $y = f(x)$ is given by

$$k = y + (1 + y'^2)/y''.$$

Setting this equal to zero, I get

$$yy'' = -(1 + y'^2).$$

To solve this, let $p \equiv y'$, so that $y'' = dp/dx = dp/dy \cdot dy/dx = p(dp/dy)$.

Substituting this in the above equation, and letting $u \equiv p^2$,

$$yy'' = yp(dp/dy) = y/2(du/dy) = -(1 + y'^2) = -(1 + p^2) = -(1 + u).$$

$$\text{Therefore } du/(1 + u) = -2dy/y.$$

Integration gives

$$u + 1 = p^2 + 1 = (y/a)^{-2},$$

where a is an integration constant.

Therefore

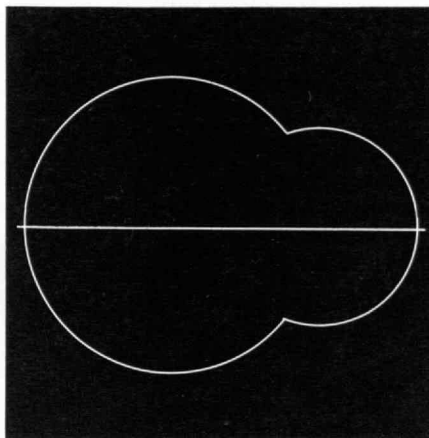
$$p = dy/dx = (\sqrt{a^2 - y^2})/y.$$

Integrating again,

$$-\sqrt{a^2 - y^2} = x - x_0,$$

where x_0 is the second integration constant. Thus $(x - x_0)^2 + y^2 = a^2$, which is the equation of a circle of radius a and center at $x_0, 0$. Thus for "nice" functions (having continuous second derivatives) it appears that there are no curves of nonconstant radius having all centers of curvature on the x axis.

Part II: "Goshawful" functions. A facetious answer to problem 16 is, "That's easy; two circles of different radii with centers on the x axis." To get around the possible objection that this is really two curves, one can put the circles together and erase certain parts:



Pursuing this line of reasoning *ad infinitum* (or, perhaps, *ad nauseam*), the answer to problem 16 can be shown to be "any ol' continuous curve of non-constant radius." To show this, note that any ol' continuous curve can be approximated by another one obtained from the first by (1) marking off the first into small segments, (2) approximating each segment with a circular arc whose ends lie on the ends of the segment and whose center of curvature lies on the x axis. Then by making the segments smaller without limit, the approximating curve comes arbitrarily close to the original curve, all the while having the required properties—almost everywhere. (Do I hear you muttering something about the "measure" of the points where it doesn't?)

Responses were also received from Donald Forman and Michael Rolle.

20 A said to the farmer, "I know you own a rectangular plot in that 20-by-20 section, and I know the area of your plot. Is the length greater than twice the width?" B said to the farmer, "Before you answer let me state that I knew the width, and I now know the length." C said, "I did not know the length, width, or area, but I now know the dimensions." What are they?

The proposer, John Mandl, disagrees with the solution published in the May issue. He writes:

The solution stated that $L_{\max} = 20$. This is incorrect. The upper limit of L is $20\sqrt{2}$, since the rectangular plot could lie along the diagonal of the 20-by-20 section. The solution stated that $W \leq 10$, and yet the

final statement is that $L = W = 10\sqrt{2}$; these statements are contradictory. This approach to the problem is one I had not considered; my original approach was one which confined the analysis to the case of integer length and width. This approach resulted in the following:

1. Of all possible values for the area, we can immediately discard those areas bounded by unique L and W . For instance, if A knew the area to be 7, the dimensions would have to be 7×1 , and there would have been no need for his question.

2. A's question, "Is the length greater than twice the width?" was designed so that either a Yes or No answer would enable him to determine the dimensions. The question itself eliminates several possible areas—namely, those areas which show up twice on either side of the line defined by $L > 2W$ (such as $A = 18$, which can be formed by 18×1 , 9×2 , or 6×3 , because a possible Yes answer would not have told A whether the dimensions were 18×1 or 9×2).

3. After eliminating all the unique and the duplicated areas, B—knowing the W —had only one possible area left and consequently could determine L .

4. C examined all the widths for the remaining areas, found only one W which was accompanied by a single area, and was able to duplicate B's analysis. The final solution with this approach is $W = 11$, $L = 12$. (Incidentally, plots of 27×1 , 26×2 , etc., will fit in the 20-by-20 section.)

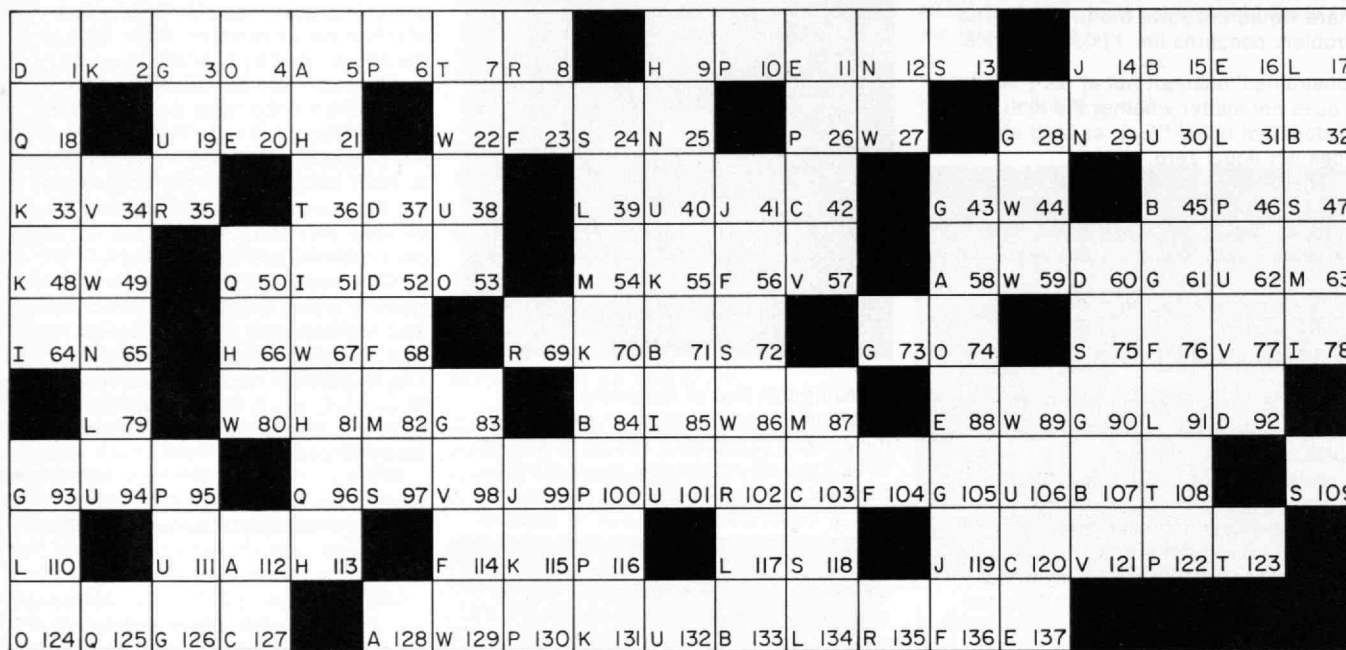
Responses also received from M.B. Brilliant, Robert C. Fleetham, and T. A. Ginsburg.

There have been a number of additional responses to other earlier problems:

- 12** John Price
- 18** James W. Dodson
- 21** Frank Rubin
- 22** Frank Rubin
- 23** Donald F. Morrison
- 25** Frank Rubin
- 27** James W. Dodson, Robert Pogoff, and Robert C. Hall
- 30** William Ackerman, R. N. Assaly, Gerbert Barnard, Harold Donnelly, Woodrow M. Hazel, Charles Heiberg, Thomas H. Kick, J. A. Jacobs, J. T. O'Connor, G. Stephen Pittman, Victor W. Sauer, Balbir Singe, and—of course—Frank Rubin.

Allan J. Gottlieb, who studied mathematics at M.I.T. in the Class of 1967, is a member of the Mathematics Department at Brandeis University, Waltham, Mass. 02154. Send problems and solutions to him at that address.

Anniversary Bonus



Use the definitions at the right to help define the words to which they refer; then enter the appropriate letters in the diagram to complete a quotation from a scientific work. The first letters of the defined words give the author and title from which the quotation is taken. Black squares in the diagram indicate the ends of words; when there is no black square at the right end of the diagram, the word continues on the next line.

The correct solution to this Tech-Crostic will appear in the December issue of *Technology Review*.

David L. Holt is Assistant Professor of Metallurgy at M.I.T. He will welcome readers' comments; address him in care of *Technology Review*, Room E19-430, M.I.T., Cambridge, Mass. 02139.

A. A C.G.S. unit of illumination.

58 112 128 5

B. Fashionable quarter of London (2 words).

45 107 71 32 15 133 84

C. Story to explain some practice, belief, institution, or natural phenomenon.

42 127 103 120

D. Moral, ideal, or universal element in a work of art; distinguishing character of a group.

52 92 37 60 1

E. Heavy, gaseous element resembling argon, but radioactive.

16 88 137 20 11

F. Substance which, from its capacity for certain reactions, is used in detecting, examining, or measuring other substances.

56 76 104 114 136 23 68

G. Under obligation to (2 words).

28 105 61 126 43 73 3 83 93
90

H. Rounded division.

9 81 66 113

I. Oblivion; forgetfulness.

78 64 21 51 85

J. Large, flat-bottomed boat.

14 99 41 119

K. Pertaining to the ocean.

2 55 70 115 131 33 48

L. All the kinds of birds of a region.

79 17 117 110 134 91 31 39

M. That part of an automobile to which are attached the windshield and instrument board.

63 82 54 87

N. Current of air or water running contrary to the main current.

12 29 65 25

O. Combining form meaning hollow vessel, denoting some relation to a cell or cells.

4 53 124 74

P. Serving to discover or to stimulate investigation.

46 95 100 6 10 116 26 130 122

Q. To produce designs by lines eaten in by a corrosive.

18 50 96 125

R. To be able, second person singular.

8 69 35 102 135

S. Growth-promoting vitamin of the B complex.

97 118 72 13 47 75 109 24

T. Line of union of two pieces of welded metal.

108 123 7 36

U. Element definitely identified in a heavenly body but not found in the crust or atmosphere of earth.

40 30 106 94 19 38 111 132 62
101

V. To groove internally with spiral channels.

98 121 34 77 57

W. Whist hand containing no card higher than a nine.

44 86 129 89 22 59 27 67 80
49

A Celebration—a Prize!

To celebrate the completion of Tech-Crostic's first full-time appearance in a full volume of *Technology Review*, the editors are pleased to announce a prize. To the reader whose correct solution to this month's Tech-Crostic bears the earliest postmark from each major zip code area (the first digit of the five-digit code), the *Review* will award the rare "Music at M.I.T." centennial record album of works performed by the Choral Society, Orchestra, Glee Club, and Concert Band of M.I.T.—a prize worth far more than the modest postage which our readers must invest in competing for it. Send correct solution and comments to David L. Holt in care of *Technology Review*, Room E19-430, M.I.T., Cambridge, Mass. 02139.

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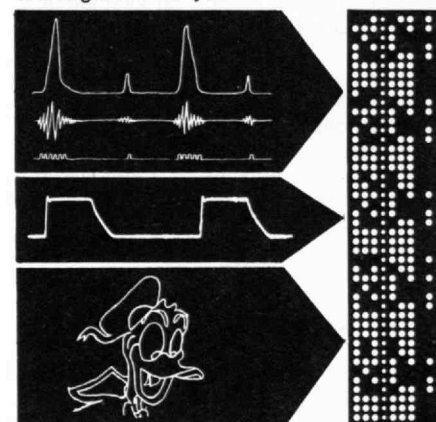
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Robert F. Lathlaen, '46, Vice-President

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On City Problems and the Panthers

The Emerging Mobile Home

To the Editor:

I read with much interest J. Karl Justin's fine analysis of the building industry in the May issue of *Technology Review* (pp. 22-29), and in general I agree with his appraisal of the situation. However, I do not view it as pessimistically as he does. My hopes for the emergence of the mobile home industry rest on four reasons:

1. From what I read and hear, the building trade unions are worried about the effect of the mobile homes on the amount of work available to these unions, and hence are much more willing to make concessions in building methods and construction standards.

2. These homes have a tremendous first-cost advantage. I have before me the specifications of a mobile home of 1,440 sq. ft. (which I have seen) available in my area at less than \$14,000! These homes also have tax and maintenance expense advantages over standard houses.

3. Granted that mobile homes now look like freight cars, there is no reason why someone cannot design an aesthetically pleasing one. So far no one has tried.

4. Now as to acceptance: May I point out that Mr. Justin's statement that mobile homes have been successful "at an obvious price in the quality of living" is a subjective conclusion. I agree with it, but there are many people in all walks of life who would not live any other way. These range from a retired fellow vice-president to an appliance repairman—and many others who are personal acquaintances of mine.

Strangely enough, one of the things that occupants of mobile homes like is the crowded condition found in mobile home parks! But then, modern man seems to fear isolation—witness the fact that the authority in charge of California state campgrounds has placed the camp sites closer together at the request of the users of these facilities.

G. C. Delvalle
Riverside, Calif.

Mr. Justin responds as follows:

Mr. Delvalle's points about my article are certainly well taken. Actually, I did not have the intention to suggest solutions—or more pertinently to rule out any.

Although there are problems or restrictions in mobile homes as currently designed, I do not think one can say that these limitations cannot be overcome. Improvement here may well have to await the development of rationality of acceptance which I touched on later in my paper. This is perhaps a circle I should have drawn more carefully.

In any case, the treatment of mobile homes by zoning regulations and other community restrictions and the resultant limitations on environmental choices for those who want to live in mobile homes serves further to illustrate my thesis that there are more basic influences on building than just available technology.

Urban Transit: For Whom, and How?

To the Editor:

The article by Martin Wohl ("Urban Transport We Could Really Use," *Technology Review* for June, pp. 30-37) raises a provocative argument against rapid transit but seems to be conceived out of fabricated beliefs. Nevertheless, I enjoy reading Martin Wohl's articles because they are stimulating.

The author makes no mention of the stated purpose of BART, only his surmise of the purpose of BART. As a former member of the BART Commission and District, I can assure you that Mr. Wohl has either misunderstood BART or chooses to ignore its real purpose.

Stated in its simplest terms, BART is being created to reduce downtown congestion from automobiles. Downtown in this case refers to San Francisco, Oakland, and Berkeley. It was not intended that BART serve a majority of the workers in the downtown areas. Why build a transit system for those who are already getting to the downtown area without using their cars?

Also I find something wrong with the statistics frequently used by the author. On page 31 of his article he states that 72 per cent of San Francisco workers live in San Francisco. This figure may have been true many years ago, but it is in strong contrast with the results of the Bay Area Transportation Study Commission Report dated May, 1969 (Table 5-6, page 45), which shows less than 60 per cent of San Francisco workers living in the city. It is true that of those who live in the city most use the San Francisco Municipal Transit System (buses and streetcars).

BART is a suburban system. Its purpose is to reduce automobile congestion in areas where geography has so restricted land use that the automobile is incompatible.

Regarding his suggestion that taxicabs are the ideal solution, I would like to see a cost-benefits analysis before being committed to any such program. In my experience the difficulty with taxis and buses is that these are heavily labor-oriented transit facilities, and the cost of labor is uncontrollable. Thus AC Transit, which will be the principal bus feeder service to BART in the East Bay, already has three times the estimated labor costs projected from its beginning 14 years ago. One visit to New York City should convince anyone that taxis are not the solution for a geographically limited city.

By Martin Wohl's definition, Santa Clara County is a suburb of San Francisco. However, we have over one million people in the county and are about to embark on a county-wide transit system of our own. I am confident that taxicabs and buses are not the answer. In fact, the public has already rejected a proposal for buses (September 16, 1969).

Clearly, this article lacks credibility and has all the earmarks of being conceived in a tower of intellectual curiosity without concern for reality.

John C. Beckett
Palo Alto, Calif.

The author is Vice-Chairman of the Transportation Policy Committee of Santa Clara County, Calif.—Ed.

To the Editor:

I cannot agree with Martin Wohl's implied thesis that the improvement or establishment of commuter railroad lines conflicts with the needs of mass transit.

On Long Island where I live there are 90,000 daily commuters into New York City. The shift of jobs out of the central city has more than been offset by the rise in suburban population, resulting in increasing demands for rail service on Long Island in the last 10 and 20 years. Because of the already crowded subway and highway networks, there is no feasible alternative for the vast majority of these people. In fact, there is serious discussion of imposing punitively expensive toll rates for private cars entering Manhattan during rush hours.

Suburban commuter railroads have traditionally been the stepchildren of large, conservative railroads whose refusal to maintain adequate standards generated their disappearance or takeover by local and state government.

It is hard to imagine Mr. Wohl's proposals for taxis and dial-a-bus services being applied to a high-density, overpopulated area like New York City. Until someone makes a technological breakthrough, the internal combustion engine will continue to be the worst answer because of smog, noise, and the small numbers of people that can be carried on an express highway per hour compared with a parallel rail route.

In conclusion, I am tempted to think that each metropolitan area has its own problems depending on size, geography, work and residential patterns, etc. Ideally, an integrated mass transit system will move masses of people regardless of income bracket or on which side of the city they live. (The new Second Avenue line in Manhattan will serve both high- and low-income neighborhoods, and both will benefit from its construction. A projected line from Queen's to Manhattan would serve primarily middle-income people.) Ideally, those who can pay for transit will do so through taxes and those who cannot will be subsidized. Rather than say that commuter railroad lines should somehow be thrown under the rug, why not do something about excessive office building construction in places like lower Manhattan, where there will soon be more 9-to-5 jobs than people can possibly get to?

Patrick Swords
Rockville Center, N.Y.

To the Editor:

Martin Wohl points out that the new rail rapid transit proposals are not really the best choice but are built to an engineering standard calling for a high average en route speed. Instead, the optimum choice is a prosaic item consisting of taxis and buses.

The next article in the very same issue is on "Pure Technology"; was it put

there by the Editor to indicate to us the reason we choose the poorer transportation system? That reason is that a high-speed train sliding quickly down its gleaming steel rails is more appealing to contemplate than a bus-taxi system merely getting people from point A to point B. What's needed is to invent a bus that would be a delight of pure technology, and the transportation system problem will be solved.

Peter M. Silverberg
Manchester, Conn.

Mr. Wohl limits his response to these three letters to the single observation that, as a Long-Island-to-New-York commuter, Mr. Swords belongs to a group which represents less than 8 per cent of the downtown workers and less than 2 per cent of the New York region workers. By contrast, he writes, "my attention and concern, while including this small group, is more importantly focused on the problems and possibilities for all urban dwellers and workers."
—Ed.

The Black Panthers and Political Change

To the Editor:

I am sorry that *Technology Review* elected to give further exposure to Johnathan Beckwith's views on the worthiness of the Black Panthers and the necessity of radical political change (June, 1970, p. 85). I think that Dr. Beckwith knows not the mischief he makes, and I call your attention to the critique of his views published by Dr. Daniel Musher, Research Fellow in Infectious Disease at the Tufts-New England Medical Center, in the commencement issue of the *Harvard Crimson*, following several private communications.

Dr. Musher wrote in part, in his open letter in the *Harvard Crimson*, "In my first letter to you (May 18, 1970) I congratulated you on your having received a \$1,000 award for your recent work on enzymes. The purpose for my writing was to ask you about your decision to donate the prize money to the Black Panther Movement. I pointed out that although I too might be sympathetic with their programs to provide socio-economic betterment and a sense of black community identity, I deplored the virulent antisemitism that appeared to be an integral part of their teachings. I also wondered whether it wasn't a bit condescending for people of Jewish descent to be so willing to denigrate their own historic identity while advocating the importance of that kind of tradition for others—but I didn't mention this.

"In any case, I expected to hear from you, and was disappointed when I did not.

"Thus I wrote to you again on May 28, this time enclosing clippings from *The Black Panther* in which Jews were described as 'swine,' 'flunkies and boot-

lickers,' 'Zionist fascist hoodlums,' etc. There was also an article in which Judges Friedman and Hoffman, several of Bobby Seale's codefendants, and the 'flounders of the White Left' were all lumped together as 'Zionist racists.' I tried to point out that what these people had in common was not that they were Zionists, but that they were Jews. *The Black Panther's* view thus appeared to be neither anti-Zionist, nor anticapitalist, nor anti-establishment, but plainly anti-Jewish.

"I asked whether you believed this was merely rhetoric, as I have heard some people suggest, and whether an entire generation of young blacks will be able to distinguish this rhetoric from fact as they grow up.

"I asked you then, as I do now, whether your gift to the Black Panther Movement indicates that you condone such views. If not, have you made your objections known to them, or to those in the white community who applauded your generosity? Have you tried to get them to change these views? Finally, don't you think it is fatuous, if not self-destructive, for liberals of Jewish descent to give unqualified support to organizations which espouse strongly antisemitic views?"

Richard J. Wurtman, M.D.
Waban, Mass.

Dr. Wurtman is Professor of Endocrinology and Metabolism at M.I.T.—Ed.

July/August Crostic Solution

This difference between the behavior of liquid and solid is understandable since for a liquid the packing of atoms is identical on any arbitrary plane cut through the phase. For a solid, however, the arrangement of atoms is a function of the plane.—(Richard A.) Swalin, *Thermodynamics of Solids*.



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TR-370

The Presidency and "the Freshened Sense of New Vision": Mr. Johnson Moves Up

Howard W. Johnson, who has been President of M.I.T. since July 1, 1966, will succeed James R. Killian, Jr., '26, as Chairman of the M.I.T. Corporation on July 1, 1971, and a search is now being mounted for a new President for the Institute. (Dr. Killian announced his own plans to retire from full-time service on June 30, 1971, at last June's Alumni Homecoming Day luncheon—see *Technology Review* for July/August, pp. 81-82.)

Mr. Johnson's announcement on September 9 surprised the M.I.T. community as much as had his selection five years earlier. His decision was made after consultations continuing throughout the summer with the Executive Committee of the M.I.T. Corporation, and the announcement itself came after a special meeting of the Corporation Wednesday morning.

"New Ideas and New Responses"

Three factors obviously figured in President Johnson's decision to leave the Presidency of M.I.T.:

1. His sense that in these times of rapid change on American campuses, an institution's chief executive needs most of all to be a source of new ideas and new responses. Indeed, President Johnson wrote to Dr. Killian this summer in a letter released on September 9, "The Institute throughout its history has gained from the freshened sense of new vision that new men and new experiences bring to this vital place."

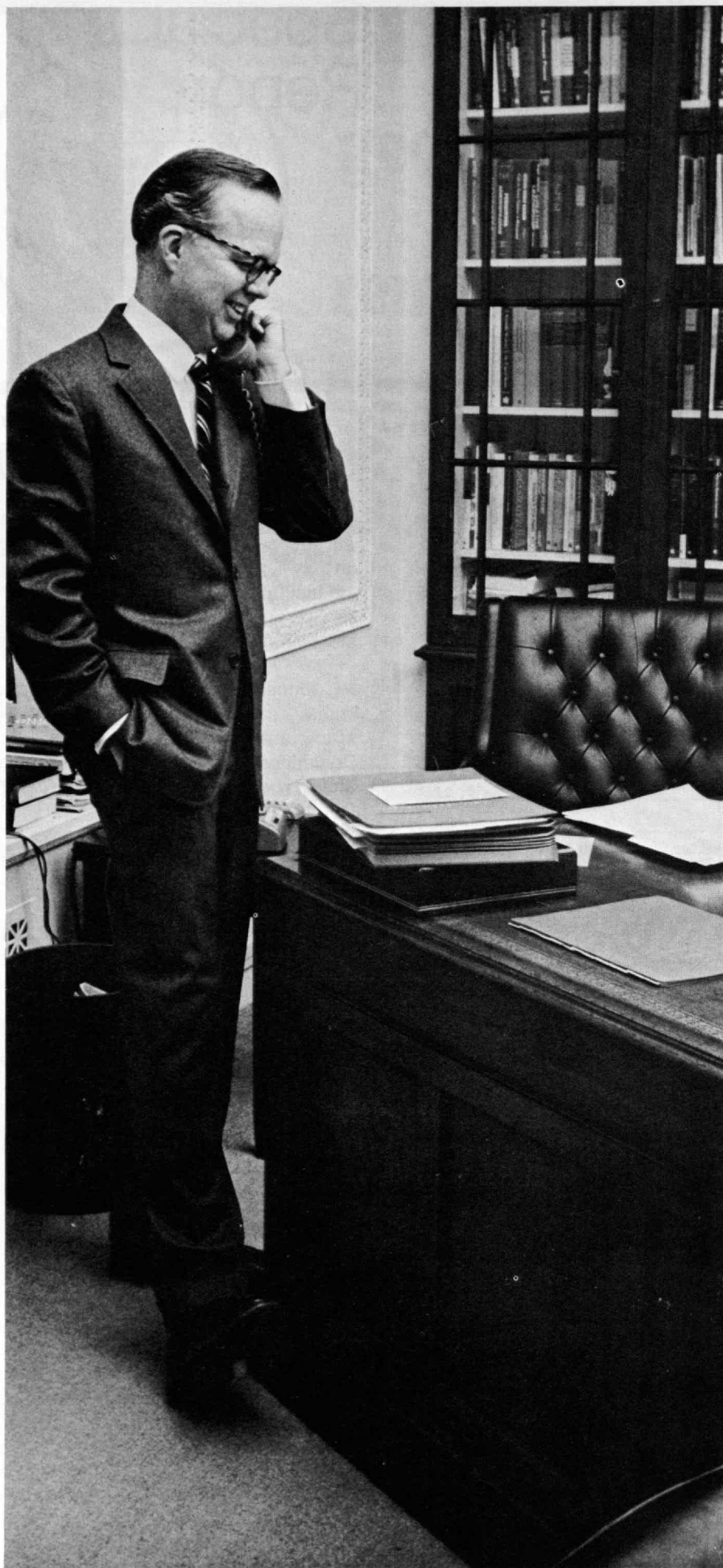
President Johnson told the *Boston Globe* that he sees "a constant need for vital institutions like universities to renew their leadership thrust more regularly. A system of more rapid successions to college presidencies would certainly help."

2. His desire to be relieved of the heavy personal burdens of the Presidency as it is now developed at M.I.T. Though Mr. Johnson said in his statement on his plans, "The role of the president remains the most fulfilling as well as the most demanding of assignments," he emphasized to the press at a conference on September 9 the "toll of time" that the presidency of a large academic institution now exacts. Only two weeks earlier he had been quoted in *Newsweek* about the modern college presidency: "The demands of the job have substantially increased in the past few years. The president is always visible, always at the center of every problem that emerges on campus. Ours is a responsibility that one takes with his eyes wide open." He told the *Boston Globe*, "There have been countless exhilarating experiences, but the job takes—or really grabs—every minute of the day."

3. The need for a reassessment of the presidency of an institution such as M.I.T. "Any organization wholly dependent upon a single individual in these

Leading an article by John Davenport, Fortune magazine last May recorded the judgment that Howard W. Johnson may be "the best damned university president in the U.S." "He has brought to his office," wrote Mr. Davenport, "two indispensable qualities: a buoyancy that can turn problems into opportunities, and a capacity to manage that Johnson defines as the 'art of studying the facts and then reaching a firm decision.'"

Now Mr. Johnson has announced his plan to leave the Presidency and to accept the M.I.T. Corporation's bid to become its Chairman next July 1. James R. Killian, Jr., '26, Chairman since 1959 whose plans to retire next June were announced earlier, expresses his own gratification. And he calls attention to the continuity in direction of the Institute which is made possible by this use of M.I.T.'s unique arrangement of President and Chairman, both making major commitments to the leadership of the institution. (Photo: Bob Lyon for M.I.T. Graphic Arts)



kinds of times is bound to be running high risk, and high-risk situations do not produce effective change," Mr. Johnson told *Technology Review*. Indeed, he said in his letter to Dr. Killian, "I believe our structure needs to be redesigned so that some of our most able colleagues could share with the President and the Provost the full operational responsibilities of the Institute. Such a reassessment," he wrote, "could best be done if it were clear that I, personally, were leaving the office."

"The Best Years of My Life"

Accordingly, the Corporation, beginning its task of finding a successor to Mr. Johnson, named a Committee on the Presidency (see *next page*) with two assignments: to work with Mr. Johnson, Dr. Killian, and other administrative officers in reassessing the structure of the Office of the President; and to recommend to the Corporation candidates for the Presidency.

President Johnson's commitment to M.I.T. remains strong. In his statement on September 9, referring to the five years he will have served in the Presidency, Mr. Johnson said, "They have been the best years of my life. They have been years of strength for M.I.T. as well. The ferment and pace have made them difficult years. But this is the price of responsibility for any institution that is not content to stand still. I am proud of the way that the Institute has engaged the urgent agenda of the world of education.

"For a variety of reasons, including some good ones, the presidents of colleges and universities in these years are the most expendable part of the process that seeks answers to the larger questions before us. I have no complaints on this score. . . . I am deeply appreciative of the support I have had over the years from the Chairman and the Corporation, the Provost and my associates in the administration, the faculty, the students, and the alumni. . . . I look forward to the chapter that now begins."

Extraordinary Measures for New Resources

As Chairman of the Corporation, Dr. Killian said in a statement on September 9 that "the Corporation deeply regrets President Johnson's decision to withdraw from the presidency next June. But it views with enthusiasm his continuance at the Institute," which will thus have "the benefit of Mr. Johnson's proven gifts as an educator and will have continuity of leadership."

In turn, Mr. Johnson emphasized to *Technology Review* his pleasure in Dr. Killian's agreement "to remain very much involved in the work of the M.I.T. Corporation and in the development of the Institute's resources" after July 1.

As to his own role as Chairman, Mr. Johnson suggested that, as with the Presidency, "the role of the Corporation, and especially the Executive Committee, needs to be reviewed," and he pledged to work with the Committee and Dr. Killian on this task. "We are now in a period of history when a closer link between trustees and internal constituencies is a necessity," President Johnson wrote to Dr. Killian.

Mr. Johnson expects his Chairmanship to be "less than a full-time position" in order that he will have "the requisite sense of separation from operational responsibility" and "to assure a needed perspective."

In the meantime, Mr. Johnson wrote to Dr. Killian, "given the present financial pressures on the Institute, it is vital that extraordinary measures be undertaken to attract new resources for M.I.T. Our forward momentum is at stake. I would join you," he wrote Dr. Killian, "in major efforts to seek large new funds during the coming year. I believe with you that such an effort will require the help of our colleagues on the Corporation and on the faculty. It is essential if the promise of M.I.T. is to continue."

Though more distant observers may have assumed that advancement from President to Chairman of the M.I.T. Corporation is an Institute tradition, few if any at M.I.T. expected Howard W. Johnson to leave the Presidency. With the term not yet started and the faculty not yet in residence, James R. Killian, Jr., '26, Chairman of the Corporation, used this method to bring the news quickly to those most affected by it.

Toward New Organizational Forms

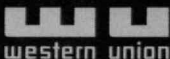
Can Howard W. Johnson, who came to the Presidency of M.I.T. from the Institute's school of management, now lead M.I.T.—and perhaps with it other American universities—to a new concept of how it can manage itself more effectively while fulfilling its growing responsibilities?

In his statement on his future plans (see *previous pages*), President Johnson noted on September 9 that "many pressing issues remain before us and other universities. There are critical questions for the future of higher education. How we respond, how we lead, how we foresee, will bear directly on the quality of educational opportunity for years to come.

"How do we relate the advancement of knowledge to the problems of our society without becoming politicized? How do we assure the healthy process of dissent without the eroding force of violence? How do we achieve educational change without impairing our standards of scholarships? How do we press forward in science and technology with awareness of the full impact of discovery and development? How do we act responsibly on that awareness? How do we finance higher education? How do we continue to merit the public trust?"

In considering these questions, Mr. Johnson this summer focused on one special issue—the structure of the presidency itself, and of the other agencies by which the university is governed. He wrote to James R. Killian, Jr., '26, his conclusion that "we are at a point now when we would profit from a careful reassessment of the structure of the presidency itself.

"We are in a time of change, of high expectation, and of unrelenting testing of our institutions. In this context we have discussed the needs for developing new forms of organization that can best serve the educational and research purposes of the Institute. We will continue to need, I am sure, a president who is responsible and accountable as my predecessors and I have been.


Telegram

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MORNING ELECTED =PRESIDENT HOWARD W JOHNSON CHAIRMAN
OF THE CORPORATION =TO TAKE OFFICE ON JULY 1, 1971.
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NEXT JUNE, WE VIEW WITH ENTHUSIASM =THE CONTINUITY IN
LEADERSHIP PROVIDED BY HIS ACCEPTANCE OF =
THE CHAIRMANSHIP =
JAMES R KILLIAN JR CHAIRMAN OF
THE CORPORATION .

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But I believe our structure needs to be redesigned so that some of our most able colleagues could share with the President and the Provost the full operational responsibilities of the Institute. I believe that such a study of the presidency should be undertaken immediately, that it should utilize the present work of the M.I.T. Commission, and that it should be concurrent with the search for one or more individuals to hold the required posts.

"I share with you the feeling that, as with the presidency, the role of the Corporation, and especially the Executive Committee, needs to be reviewed. As Chairman, I would seek to conduct such a review with your help and the help of the Executive Committee. It has seemed clear to both of us that we are now in a period of history when a closer link between trustees and internal constituencies is a necessity. The members of our Corporation will have to carry major responsibility in achieving an added strength and clarity for the Institute in these new times and in building a growing base of trust and understanding on the part of our alumni and the external public."

Choosing the New President

The M.I.T. Corporation's new Committee on the Presidency, charged with a study of the structure of the Office of the President as well as with recommending to the Corporation who should be its new occupants (see *previous pages*), is chaired by James B. Fisk, '31, President of Bell Telephone Laboratories, Inc. (It was Dr. Fisk who five years ago led the Committee on Succession which recommended Howard W. Johnson, then Dean of the Sloan School of Management, only days before Mr. Johnson was to leave the Institute for a position in industry.)

Serving with Dr. Fisk will be seven other members of the M.I.T. Corporation, six of whom are alumni: Vannevar Bush, '16, Honorary Chairman of the Corporation; Paul V. Keyser, Jr., '29, former Executive Vice-President of Mobil Oil Corp. who is President of the M.I.T. Alumni Association; Carl M. Mueller, '41, Partner in Loeb, Rhoades and Co.; Julius A. Stratton, '23, Chairman of the Ford Foundation and President Emeritus of M.I.T.; George W. Thorn, Physician-in-Chief of Peter Bent Brigham Hospital; Jephtha H. Wade, '45, Partner in Choate, Hall and Stewart (Boston); and Uncas A. Whitaker, '23, Chairman of the Board of AMP, Inc.

The faculty has been invited to appoint an advisory group to assist the Committee on the Presidency, and the Corporation's Joint Advisory Committee on Institute-Wide Affairs, which includes students and alumni as well as members of the faculty and Corporation, will also participate in the search.

The work of the Commission on M.I.T. Education, one of whose task forces is concerned with the governance of the Institute, will be utilized by the Committee in its studies of administrative structure.

Institute Review

Alumni Correspondence

Toward Peace or Destruction?

To the Editor:

Copious conversation and correspondence on the occasion of my 50th year of service to my Class as its Secretary impels me to make the following comments.

In common with many of my contemporaries, we feel deeply disturbed and distressed as we witness our beloved and respected institution dirtied, defiled, and disrupted by its present occupants, albeit a relatively minor portion of them.

We find ourselves perplexed at the strident demands for "peace" by the young people. During our years of experience it somehow eluded us that, however ardently peace was desired, it took more than a single nation to achieve it. We never considered peace to be a one-way proposition.

We feel equally perplexed at the tendency to encourage weakening of our country's defenses at the same time that the rigidly disciplined youth of nations diametrically opposed to our free and democratic way of living go quietly and steadily about their business of building up the capacity to destroy us.

Harold Bugbee, '20
Winchester, Mass.

The Majority and the Radicals

To the Editor:

I have taken the liberty of quoting from Klaus Liepmann's speech to the M.I.T. faculty (page 83 of the May issue of *Technology Review*), particularly his concern with the development of a police state. However, I have used these quotations in a somewhat different manner of speculation. I fear a police state not of the type Professor Liepmann suggested but more of the type as feared by Senator Margaret Chase Smith. Her fears are that the militants may force the "silent majority" to demand protection from these unruly militants. The re-nomination of Ex-Governor Wallace has, I fear, such a connotation.

However, there also is the danger of a Hitler type in this country. This would

develop as Hitler himself developed, from unlikely but possible combinations of anti-establishment militants. Hitler grew in power by combinations of militants who were willing to bomb government offices, buildings, police stations, willing to kill private citizens and public officials, willing to use threats and force to intimidate Germany's silent majority. A tired and peace-loving president abdicated his power to avoid civil war. Hitler was never elected by the people. He represented the will of the Nazi party which numbered less than 10 per cent of the population.

The violent radicals of our society could possibly be combined. The Woodsmen faction of S.D.S., the Black Panthers, the various groups who pledge allegiance to Ho Chi Minh, to Che Guevara, to Mao, the followers of other Communist groups dedicated to the overthrow of democracy are all susceptible to unification were the conditions ripe for such union. These groups rarely will engage in discussion or reason. They shout down any speaker with opposing views and like Hitler's Brown Shirts attempt to wrest power from elected officials by force and intimidation. Had President von Hindenburg curbed the growing power of Hitler when this movement was in its developing stage, the world and Germany would have been spared the atrocities brought on by Hitler when he finally was able to consolidate his minority power and burn the Reichstag. And he left a legacy of a written blueprint for any future demagogue to follow.

I have endorsed M.I.T. President Howard W. Johnson's procedure of applying the forces of law and order to eliminating these destructive agents from the liberals who seek only to be heard. I am appalled by the failure of the administrations of schools such as Yale and Harvard, Trinity and Wesleyan, and many others who try to shield these arsonists, saboteurs and brutes under the delusion that academic freedom requires freedom from obedience to the laws of our society. Re-establishment of law and order on our campuses so that proper investigation and discussion can be established will prevent either type of Hitler developing. It will prevent the development of a Communist takeover in the United States. As in Hitler's Germany

the Communist party is the ruling clique in Communist countries and usually includes less than 10 per cent of the population as Party Members. It will prevent the development of a government devoted to the suppression of dissent under the guise of law and order.

An educational institution is expected to educate the young and inexperienced. The teachers are expected to be older and more mature. One of the subjects that should be taught is the art of thorough investigation before decision, including some skepticism, some doubt, some questioning that any single answer can forever solve any problem. It should also include training in the art of patience, of tolerance, of sympathy, but not these at the price of license.

Frank O. Pierson
Cromwell, Conn.

Professor Liepmann, who is Chairman of the Music Section at M.I.T., responds as follows:

I was wondering whether I would ever hear from the "silent majority," having been swamped by signs of approval by old and young. We are really not as far apart as Mr. Pierson seems to think. Like him, I am greatly worried about the radicalization which we are witnessing. Just as Senator Margaret Chase Smith, I am deeply concerned that a Nazi dictatorship might emerge.

Only our interpretation of events differs: I wish our "Law and Order" agencies would protect our presidents and the presidential candidates. I wish they would have protected one of the most effective nonviolent black leaders, Martin Luther King—instead of having him smeared after his death by the head of our F.B.I. as Communist. I would hope that our National Guard would not shoot at students and that our C.I.A. would stop meddling in other countries' struggles for independence by creating unsuccessful counterrevolutions which regularly support a Fascist "elite."

Mr. Pierson is mistaken if he equates the many Americans who protest Vietnam and Cambodia to a small radical fringe. The latter would be still smaller if the

President would communicate with all citizens. When thousands peacefully demonstrated in Washington and read the names of soldiers killed in Vietnam, the President ostentatiously turned away from them, watched television and called the students bums. An escalation towards rioting was the consequence.

During my entire life I have been told that "we must fight communism." But in Germany that only led to Nazism (backed by a rather vocal majority who elected Hitler—read Shirer's *Rise and Fall of the Third Reich*—and communism spread. I am indeed afraid that the same might happen in America. We cannot (nor should we) fight communism in Russia, China, Indo-China, South America, or Africa. The way to avoid it in the U.S.A. is to take care of our own pollution, provide jobs, housing, education, health care for all of our people, avoid inflation, and solve our problems of transportation.

Facing the faculty and in response to Mr. Pierson's letter, I feel compelled to say that the Hard Hats beating up peace demonstrators reminded me of the Brown Shirts, Agnew's intemperate fulminations of those of Goebbels. Above all, I am afraid of the alliance between the industrial and the military establishment (Krupp and Hitler) of which President Eisenhower warned us not so long ago.

Professor Liepmann also suggests that readers of the Review may be interested in the following comment sent to him by Robert G. McGregor, a graduate student in mechanical engineering at M.I.T.:

Your words at the Sunday faculty meeting raised a point which mankind has witnessed time and again throughout history. Rereading the script of your address to the faculty impressed upon me that "intellectuals and artists" of our own society have already begun to respond. Many of us in the younger generation feel that a national awareness is no longer contained only within our own age group. We thank you for verbalizing your personal experiences in Germany and expressing an opinion on what has been disruptive within our own nation for many years now.

On Voo Doo and the Changing Times

To the Editor:

A stray, unsympathetic sentence in *Technology Review* for July/August (p. 2) was the first notice I received of the death of Voo Doo. It deserves a better obituary.

Social historians may someday find the back files of Voo Doo in the Institute library to be of great value—and I imagine that even they will sometimes find themselves laughing aloud. For 50 years, since 1919, Voo Doo was published monthly during the academic year, and its issues during that half century reflected the times to perfection. Those from the Roaring Twenties are replete with hip flasks, flappers, and jalopies; those from the forties give a fascinating perspective on a nation at war, and, later, display the sometimes bizarre humor of that war's veterans; those from the sixties display the uncertainties of the times, as the Voo Doo formula of beer, broads, and hairy-eared engineers evidently failed to speak to a changing Institute, and successive editorial boards searched, without success, for a new formula. During its lifetime, Voo Doo was read, presumably with enjoyment, by hundreds of thousands of paying customers. (As recently as 1964, its circulation was about 3,000.) Surely, it contributed to relieving the tension and pressure which have historically been part of an M.I.T. education. Certainly it did so for the several thousand undergraduates who were involved in its production and distribution. Voo Doo served the Institute well, although various deans didn't think so at the time.

At times Voo Doo was sophomoric, but then many of its staffers and readers were sophomores. When Voo Doo was good, it was very good indeed; in polls of humor magazine editors it always placed in the top dozen or so in the country, and cartoons and articles from the magazine were frequently reprinted in anthologies of college humor. Nostalgia aside, old grads may be surprised to see how entertaining old Voo Doo's still are.

If Voo Doo is anachronistic in 1970, to my mind this reflects less poorly on Voo Doo than on 1970. If the Institute no

longer attracts students who can produce and appreciate a humor magazine which is by intent irrelevant, then it is better that Phos should migrate to that great cat-house in the sky, and Voo Doo die.

J. Shelton Reed, '64
Chapel Hill, N.C.

The author was Editor of Voo Doo in 1963-64 and is a Fellow of the Woopgaroo Society.—Ed.

Institute Review

Tuition: Up \$150 in the First Annual Increment Ever Assessed

M.I.T.'s tuition, increased to \$2,500 per academic year (two terms) effective this summer, will be \$2,650 beginning with the Summer Session in 1971.

It is the first time that M.I.T. has raised its tuition in two successive years. President Howard W. Johnson, reporting the increase to students and their parents in August, cited continuing increases in costs. "So long as this period of rapid inflation persists, M.I.T., along with many other universities," President Johnson wrote, "must plan to raise tuition annually to keep pace with its costs."

"We are making a determined effort to reduce expenses without reducing quality in every academic and administrative area," Mr. Johnson wrote the students. But these efforts have simply not been sufficient, he said; the Institute's costs—salaries and wages, materials and services—"have been increasing sharply." As a result, he wrote, "it became clear that there was no responsible alternative to the change in tuition."

In a separate statement to the faculty, President Johnson warned that the tuition increase "will not close the gap between our projected revenues and expenses, nor will it accommodate growth or movement into new fields. For these," he said, "we must search for other sources of funds, including shifts of emphasis within existing budgets."

President Johnson pledged that additional funds will be sought to offset the tuition increase for those in need of financial aid, and he cited especially the Institute's plans to increase job opportunities open to students through M.I.T. participation in the Federal College Work/Study Program. A \$280,000 grant has been made to M.I.T. under this Program for the coming academic year, and a larger sum will be sought for 1971-72; the Program provides federal subsidy of wages paid to students for on-campus jobs of all kinds, and M.I.T. hopes to use most of the funds available to stimulate new employment opportunities for students in the academic and research programs.

The new tuition represents a 6 per cent increase over the previous figure; since 1957 the annual rate of tuition increase has varied from just under 3 per cent to over 8 per cent, averaging almost exactly 6 per cent. In the same period the average undergraduate budget which M.I.T. uses to determine awards of student aid has doubled, from \$110 to nearly \$220, and the median weekly salaries offered to bachelor's-degree graduates have increased from just under \$110 to over \$200.

Judicial Advisory Board

Following procedure suggested by the Committee on Discipline, President Howard W. Johnson appointed three faculty and two students to a Judicial Advisory Board early in June to review the Committee's recommendation that seven students be required to withdraw from the Institute until June, 1971 (see *Technology Review for July/August*, p. 82) in consequence of their participation in the occupation of M.I.T. offices on January 15 and 16, 1970.

Confirming the Committee's actions, the Board said it found "no new evidence which materially affects the several cases" and that "due process was afforded."

Accordingly, President Johnson accepted the recommendation of the Committee on Discipline in the cases of five of the seven students, whose applications (if any) to the Committee for readmission to the Institute cannot be effective until June, 1971. In the case of one student, readmission may be effective in February, 1971, instead of June; and in the case of one student who graduated from the Institute in February, 1970, action barring his readmission to any program of the Institute is subject to reconsideration upon application to the Committee after July 1, 1971.

In accordance with Institute policy, the names of the affected students were not published.

The members of the Judicial Board are Gregory K. Arenson, '70; Ralph M. Davison, a graduate student in metallurgy; Richard L. DeNeufville, '60, Asso-

ciate Professor of Civil Engineering; Carl W. Garland, Professor of Chemistry; and Paul R. Gross, Professor of Biology.

Record Alumni Participation Despite Unrest and Recession

A record total of 20,461 donors—higher by nearly 3 per cent than any previous year—gave \$2,301,176 to M.I.T. through the 1970 Alumni Fund, according to the final report by Carl Mueller, '41, Chairman of the Alumni Fund Board.

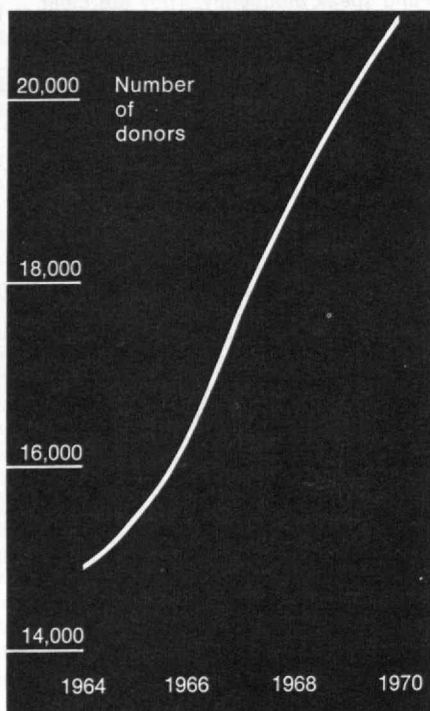
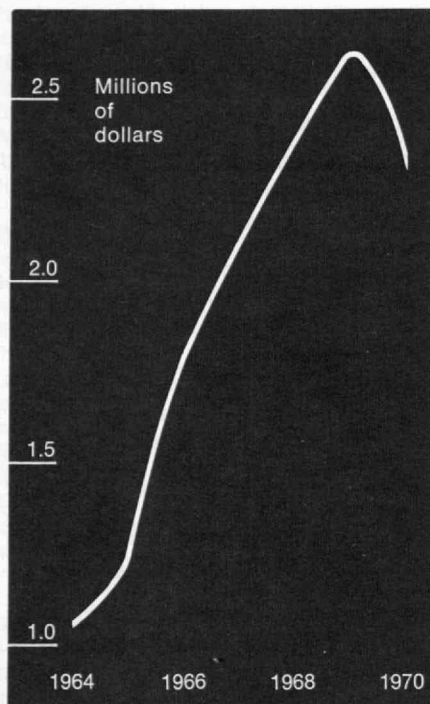
Despite the record number of donors, total gifts to the Fund were \$378,900—14.2 per cent—lower than the record 1969 Alumni Fund. While some attribute the decline in total giving to campus unrest, Mr. Mueller said that two other factors had more significant effects: changes—and uncertainties arising out of them—in the federal income tax laws; and the downturn in the economy, expressed primarily through declining prices in security markets.

But given these conditions, Mr. Mueller said, "the results of the 1970 Alumni Fund speak eloquently. They are clear witness to the alumnus' belief in the Institute, his belief that the fundamental conviction of M.I.T. will prevail after the transient rhetoric is long forgotten; his vision of alumni, faculty, and students contributing immeasurably to the cure of man's ills; his realization that stronger resources are indispensable to his dream."

The fact that—despite their concerns about campus events and young people's priorities—a record of more than 20,000 alumni elected to contribute to M.I.T. in 1969-70 cannot negate the decrease in receipts, Mr. Mueller said, though he admitted that the decrease was the first in a seven-year period "and particularly disconcerting when financial constraints on the Institute are extreme."

To support Mr. Mueller's suggestion of the effect on alumni giving to M.I.T. of the modest economic downturn in 1969-70, Kenneth S. Brock, '48, Director of the Alumni Fund, noted that gifts of securities to the Fund declined 10.9 per cent in number and 32.3 per cent in amount from 1969 to 1970.

Though total giving to the M.I.T. Alumni Fund declined in 1970—for the first time in seven years—the number of alumni participating in the fund reached record high levels. Howard W. Johnson, President of M.I.T., called the Fund report “an encouraging high point in a difficult year for all institutions of higher education.” The 1970 Fund Record, he said, “is still another witness to the concern alumni have for the Institute’s well-being. We are constantly aware of this concern,” he wrote. “We have never doubted it.” (The charts show figures corrected to reflect, for each year, new crediting rules for alumni giving effected in 1969.)



Highlights of the 1970 Alumni Fund record reported by Mr. Mueller: over 2,400 alumni gave \$100 or more to the Fund; while overall fund receipts declined, gifts from alumni who hold only graduate degrees from M.I.T. increased 39 per cent; contributions from parents of M.I.T. students more than doubled—to \$9,006—in 1970; nearly one-third of all 1970 Alumni Fund gifts were designated by their donors for use in one department or activity, including professorships, 10 per cent were designated for scholarships and loans, and 40 per cent were undesignated; gifts by 1,451 alumni were “matched” by their companies in 1970, yielding \$107,480 to the 1970 Alumni Fund.

More than half of the members of M.I.T.’s Class of 1967 (Charles E. Kolb, Jr., Class Agent) gave to the 1970 Alumni Fund—the first time that a class under 20 years graduated has achieved such a record. Two classes with 69 per cent participation—1911 and 1913 (Oswald W. Stewart and Ellis W. Brewster, Class Agents)—tied for the 1970 record.

The Class of 1923 (Herbert L. Hayden, Class Agent) gave the largest amount—excepting the reunion classes—to the 1970 Alumni Fund: \$175,424. Graduate-degree-holders in electrical engineering exceeded their record, however, with gifts totalling \$179,369.

Before graduating in June, 129 members of the Class of 1970 pledged nearly \$4,000 to the Alumni Fund designated for the support of “student-initiated socially oriented research in such fields as housing, transportation, and the environment.” Gifts from the Class of 1971, 1972, and 1973 will also be devoted to this purpose.

M.I.T.: “Perverse Ecosystem”

M.I.T. freshmen have a choice, says Wells Eddleman, ’71, President of the M.I.T. Undergraduate Association, in a letter to all members of the new Class of 1974: “If you don’t want to get involved, eat well, get plenty of sleep, do your problem sets, and escape with drugs if you wish.

“But if you want to live with some solutions, you had better think a lot, lose some sleep (and maybe your mind), and have the courage to act.”

Mr. Eddleman assured the freshmen that, whichever their choice, “you can get a fantastic education from M.I.T.—professional training, humanistic ideas, bittersweet experience.” But he warned them that the world’s problems are a corollary: “When you move to Cambridge, you aggravate the housing problem; if you have a car, you create pollution.” Indeed, he said, “when you don’t work to solve problems, you acquiesce in them.”

And then came this word of warning: “Problems worthy of attack prove their worth by hitting back, so don’t expect

instant success. Being right doesn’t guarantee that you’ll win. M.I.T. is an ecosystem of the most perverse kind: a human one.”

A Strike to Greet the Term?

As final preparations for the new term were being completed early in September, M.I.T. concluded without major incident a three-month series of negotiations with the five labor union units which represent various employees in Cambridge and at the Lincoln Laboratory in Lexington.

Though differing in detail, the new two-year contracts effective July 1, 1970, are in general similar; their provisions include:

- ◇ Wage increases of 10 per cent in the first year and 8 per cent in the second year of the two-year agreement.
- ◇ Special inequity wage adjustments for a number of classifications.
- ◇ A 10 per cent increase in the pension benefit formula and an increase in the minimum pension from \$4 to \$6 per month per year of service.
- ◇ Assumption by the Institute of the projected increase in the cost of the employees’ Blue Cross—Blue Shield Master Medical coverage.
- ◇ Establishment of a new permanent and total disability plan generally similar to that already provided for the faculty and staff.

Robert J. Davis, Director of the M.I.T. Office of Personnel Relations, said the total additional cost to the Institute resulting from the offer is equal to 12.7 per cent in wages and benefits in the first year, as well as 8 per cent in wages alone in the second year.

“Considered against the background of the Institute’s present financial condition,” Mr. Davis wrote Institute supervisory personnel late in August, “the settlement is more than just a very good offer. . . . It far exceeds any increases in the cost of living, either anticipated or already experienced. It is consistent with the pattern of settlements by major employers across the country. It will maintain the Institute’s traditional position of leadership in wage and benefit levels among local colleges and universities.”

Indeed, he wrote, “the Institute’s offer represents in our view an extraordinary effort to extend benefits broadly—an effort that could only be made at a substantial sacrifice to other needs and to the many other demands upon the limited funds available.”

The groups involved are the Research, Development and Technical Employees Union (independent), representing 1,400 workers at M.I.T., the Draper Laboratory, and Lincoln Laboratory; the Independent Union of Plant Protection Employees, representing 60 security guards at Lincoln Laboratory; the Cooks and Pastry Cooks Union (A.F.L.-C.I.O.), representing

dining service employees; and two units of the Building Service Employees' Union (A.F.L.-C.I.O.), representing maintenance and custodial personnel at Lincoln Laboratory and in Cambridge, respectively.

The Bates Accelerator

The 400-million-volt linear electron accelerator now being built by M.I.T. in Middleton, Mass. (see *Technology Review* for October/November, 1967, p. 69), will be named in memory of the late U.S. Representative William H. Bates of the Sixth Massachusetts District. It was Rep. Bates who originally suggested the Middleton site, and he gave strong support to the legislation leading to A.E.C. funding for the facility.

Harris Fahnestock, 1906-1970

Harris Fahnestock, Assistant to the Director of the M.I.T. Lincoln Laboratory since 1962, died at his home in Concord, Mass., on July 26.

Mr. Fahnestock first came to M.I.T. during World War II, when he was associated with the Radiation Laboratory. Following graduation from Harvard (B.A. 1927, M.A., 1930), he had made a career as a pilot, test pilot, and engineer in the fledgling aircraft industry.

Upon the closing of the Radiation Laboratory, Mr. Fahnestock joined the M.I.T. Servomechanisms Laboratory in the management of the Whirlwind computer project, and he transferred to Lincoln Laboratory with that project in 1951; two years later he was made Head of Lincoln's Business Administration Division.

Strengthening Counseling

A significant expansion of the staff in the office of the Dean for Student Affairs with the purpose of "strengthening M.I.T.'s resources for the counseling of students and for support of the Institute's academic program" has been announced by Dean J. Daniel Nyhart.

William Speer, Associate Dean, will continue to serve as the senior member of the office in the counseling area. He will be joined by Richard A. Sorenson, '69, as Associate Dean; by James J. Bishop, '63, Peter Büttner, '61, and the Rev. David W. Yohn as Assistant Deans; and by Nanette Lee Smith as Assistant to the Dean.

Dean Sorenson will continue to serve as Dean Nyhart's deputy and will also have continuing responsibilities in overseeing M.I.T.'s residence program as well in counseling. Dean Bishop will increase his counseling activities while continuing to devote major effort to the Institute's Educational Opportunities Program. Dean Büttner will continue as Executive Officer of the Freshman Advisory Council and therefore will have major counseling responsibilities for first-year students.

Dean Yohn, who has been Senior Pastor of the Church of Christ at Dartmouth College for seven years, will join the counseling staff full time, as will Miss Smith, who has been a member of the University of Rochester's Counseling and Special Services Staff.

The Rev. Yohn, who studied at Northwestern, the Yale Divinity School, and Andover Newton Theological School, was Associate Minister of the First Church in New Britain, Conn., and pastor of the United Church of Christ in El Paso, Ill., before taking his pastorate at Dartmouth in 1963. Miss Smith studied at Howard and Southern Illinois Universities, where she held three graduate internships in the fields of counseling to sororities, course development, and programming for culturally disadvantaged students before joining the University of Rochester; she has been a staff member of that university's Educational Opportunity Program.

Avery A. Ashdown, 1891-1970

Avery A. Ashdown, Ph.D.'24, Associate Professor, Emeritus, of Organic Chemistry who was known and beloved to at least ten generations of graduate students as Master of the graduate residence which now bears his name, died on July 15 after a three-month illness. He was 79.

Professor Ashdown came to the Institute in 1920 as a graduate student in chemistry. As Moore Traveling Fellow, Professor Ashdown attended the Eidgenössische Technische Hochschule in Zurich for one year after he received his Ph.D., and he then returned to M.I.T. where he has been ever since, first as Research Associate in organic chemistry—the field in which he graduated from the University of Rochester (A.B. 1914, A.M. 1916). He joined the teaching staff in 1930.

But Professor Ashdown's contributions to M.I.T. go far beyond the classroom and laboratory. In 1933 he organized on East Campus the first on-campus residence for graduate students and as its Master was the first faculty resident in the dormitory system. He was instrumental in arranging the purchase in 1937 of the Riverbank Court Hotel for use as the Graduate House, and he was its Master until 1962, three years after his retirement as a member of the faculty. It was named in his honor in 1965.

Professor Ashdown recently lived in Bexley Hall so as to remain an active participant in M.I.T. affairs, and he was a familiar figure at Ashdown House, in the Chemistry Department, and at the Alumni Swimming Pool. President Howard W. Johnson in his tribute noted that several years ago Professor Ashdown "estimated he had swum in the Pool as far as Salt Lake City." The M.I.T. Public Relations Office said he "long had been regarded as the Mr. Chips of the Institute."

When his portrait was completed for Ashdown House some six years ago, Avery A. Ashdown, Ph.D.'24, then Associate Professor, Emeritus, of Organic Chemistry, took amusement in standing next to it for the Institute's official photographer. Professor Ashdown's death—at age 79—this summer ended more than 40 years of loyal service to M.I.T. graduate students.



An outstandingly loyal alumnus, Professor Ashdown was a legend at Alumni Advisory Council meetings, where he took pleasure in introducing graduate students. Indeed, Professor Ashdown was to have received the Alumni Association's Bronze Beaver Award in October of this year.

Professor Ashdown had been a member of the American Chemical Society since 1917, served as Councillor and Chairman of its Northeast Section and was for many years—and even at the time of his death—Editor of *The Nucleus*. He held the 1963 James Flack Norris Award of the A.C.S. in recognition of "contributions to the high standards of chemistry education and professional ethics."

Professor Ashdown was also for many years Secretary and Chairman of the M.I.T. Chapter of Sigma Xi, and from 1940 to 1963 he was the principal officer—as Secretary—of M.I.T.'s Society of Arts, through which were arranged popular lectures in science for high school students and the public.

Clean Air Car Race: "How Clean Is It? Does It Stop?"

As this issue of *Technology Review* went to press, the 44 automobiles in the great 1970 Clean Air Car Race were on the eve of their departure from Cambridge. It was still far too early to know the outcome of the race, or the lessons it may hold.

But it was not too early to report the enthusiasm of several hundred college students—and a few high school students as well—who had devoted long days and longer nights of their summer vacations to a new kind of purposeful hot-rodding. Public enthusiasm was obvious, too, at a preview in Rockwell Cage as well as at a full-fledged auto show in front of the Boston Museum of Science.

James R. Killian, Jr., '26, Chairman of the M.I.T. Corporation, told the contestants at a send-off dinner in Cambridge on August 23 that the race was "a glorious example of constructive action by young people." And Francis W. Sargent, '39, Governor of Massachusetts, told the contestants from the same platform that "what you're going to be doing is much more than a race from Boston to Pasadena. You're going to be demonstrating that we can change the system, that there are alternatives. You are the innovators," he told the young people, "starting the changes we must make in America."

John T. Middleton, Commissioner of the National Air Pollution Control Administration, made federal enthusiasm official when he announced at an M.I.T. seminar of participants preceding the race that N.A.P.C.A. would lease for \$5,000 each the winning car in each of the race classes upon completion of the contest in Pasadena. During the two-month period of the lease, said Mr. Middleton, the cars will be used in the Prototype Phase of N.A.P.C.A.'s Federal Clean Car Incentive Program.

Earlier, N.A.P.C.A. had contracted with M.I.T. for documentation of the race, promising funds to compile technical papers and general as well as technical films covering pre-race building and testing of vehicles as well as operations of the race and the emission-testing procedures associated with it.

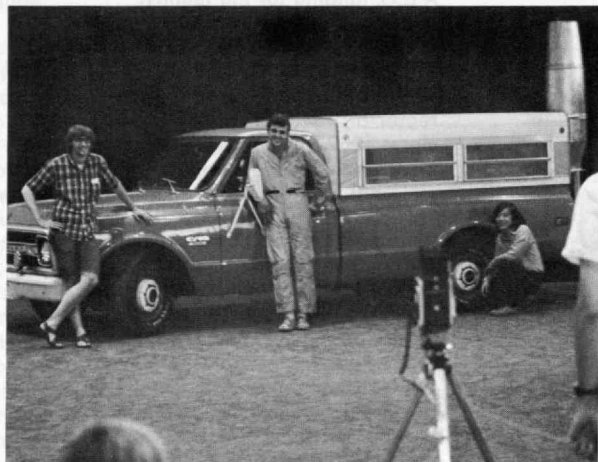
Gas, Propane, Steam, and Hybrid

No car in the race was the same as any other. There were cars whose internal-combustion engines were modified to run on liquid natural gas, liquid propane, methanol and low-octane gasoline, unleaded gasoline, pure alcohol, and diesel fuel. There were electric cars powered by batteries, gasoline-driven generators, and even an immense gas turbine. There were water injectors and air injectors, turbochargers, exhaust recirculators, and home-made exhaust filters. An Englehard catalytic reactor rode many an exhaust system.

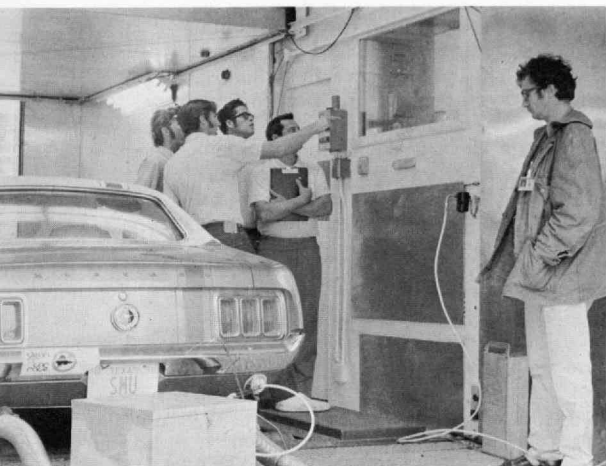
There were unnumbered retoolings of the

The pre-race week in Cambridge was enlivened for crews in the 1970 Clean Air Car Race by the spotlight of publicity as well as the tenseness of the starting line. Among the events: an address by Gordon J. F. MacDonald of the President's Council on Environmental Quality (top, left); official photography of each entry (top, center, the M.I.T. gas turbine car); official emission tests (top, right, the modified Mustang from Southern Methodist University); open houses (middle, the M.I.T. gasoline-electric hybrid and the University of New Hampshire electric, the latter still incomplete when the race began); official greetings from Governor Francis W. Sargent, '39, (bottom, left) to John B.

Heywood, Associate Professor of Mechanical Engineering who was faculty adviser to the student committee . . . and finally came the wee small hours of August 24, when some cars started for California while others attempted to resolve embarrassing problems. (Photos: Alan M. Goldberg, '69, and *Technology Review*)



More important, however, was the fact that the car itself: Ignition changes, timing changes, reshaping of valves and modifications of carburetors and manifolds. There were intricate control systems and fabricated bodies with great fiberglass mouths to gulp in air. There were V-8's, 6's, and 4's; Chevelles, Gremlins, Hornets, Volkswagens, Opels, and trucks—and vehicles whose ancestry (if any) could never be determined.



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But all had one thing in common: when they left Cambridge on August 24, all had passed preliminary tests to meet or exceed the pollution emission standards set by the federal government for 1975—11 grams of carbon monoxide per mile, 0.5 grams of hydrocarbons per mile, and 0.9 grams of oxides of nitrogen per mile, and a low minimum of particulates, including lead.

But will this standard be good enough? No, said Mr. Middleton, in his seminar address: "It is clear that even the application of the more stringent standards proposed for 1975 will only prolong the downward curve in vehicle emissions until the middle 1980's, after which time levels will again rise as vehicle use continues to increase. Clearly," he told the contestants and their advisers and sponsors, "we should be working not only on the vehicle but on the basic composition of the fuel and additives used, as well as upon transportation as a system."

More than Rube Goldbergs

Three teams of high school students came to Cambridge for the race. One, from Incline Village, Nev., entered a Dodge pick-up fueled by half methanol and half regular gasoline. A second team, from Campolindo High School, Moraga, Calif., was disqualified because its vehicle, a Honda 305, had only two wheels; but the motorcycle was indeed an electric one, powered by four batteries weighing in all over 400 pounds. The extra weight riding below the engine, the team said, gave the cycle remarkable new stability. But the prize for enthusiasm surely went to 16-year-old Kenneth Riggs from Putnam City West High School, Okla., who was the proprietor of a "whole pollution control concept." His converted Opel runs on compressed natural gas for short trips—the common ones. But he can switch to a propane back-up tank—with an automatic change of air/fuel ratio—for longer trips. He and his team designed a compressor to fit on a home natural gas line, so the car can be refilled while it sits overnight in the family garage.

Among the students and professors, innumerable industry representatives and technicians—and even among the knowledgeable visitors—there were four questions during the pre-race days: How does it work? How clean is it? How much does it cost? and Does it stop? (After all the other modifications to add new and sometimes heavy equipment, the teams seldom found time to modify their cars' brakes.)

As departure day neared, there seemed

little doubt that the more exotic the car the poorer its chances of starting—or finishing. All three M.I.T. entries—TECH I rebuilt after the 1968 transcontinental electric car race, a steam car, and a gas-turbine-electric—were having technical troubles. So was the Worcester Polytechnic Institute "Great Teakettle" (a steam-powered Chevelle)—"a little steam leak."

But Robert G. McGregor, '69, Chairman of the race committee and an M.I.T. graduate student in mechanical engineering, reminded kibitzers that "the idea of the race is not to have a bunch of Rube Goldberg contraptions that are interesting for little boys to look at." The idea, he said, is "to encourage and call attention to what can be done to drastically reduce pollutants caused by automobiles. If this can be done with a minimum of work and less than \$300 using present-day cars, why not?"

The Auto as Anachronism

Even as the student teams were disassembling and reassembling their non-polluting entries in the 1970 Clean Air Car Race from Boston to Pasadena (see above), Gordon J. F. MacDonald of the President's Council on Environmental Quality was describing to the "kickoff" dinner in Cambridge how irrational is man's relationship to the automobile.

Travelling on the highway, every driver is betting his life on the other drivers' "ability to control 3,000 pounds of complicated and sometimes malfunctioning steel and glass." That gamble is unreasonable enough, said Dr. MacDonald; but we still "place all our bets on a system of transportation that kills 50,000 people a year."

Our oil supplies are limited; "would far-sighted men be anxious to rely solely on the internal combustion engine when they know that over 45 per cent of the current production of this valuable resource goes for the care and feeding of cars?"

"Would men of reason willingly allow their government to pour \$5 billion into building highways for cars to run on when we spend only \$200 million on urban public transportation?"

"Would rational human beings choose to mobilize themselves with a system of transportation that is the chief contributor to the poisoned air that . . . endangers their health and ruins their property?"

Perhaps the automobile belongs to a different era, when we had more land and more air. Now that our cars have become such a powerful force shaping us and our lives, Dr. MacDonald told his college audience, "we must ask ourselves if we like our new shape." For himself, Dr. MacDonald is ready to make some changes: "I believe that some basic restructuring of our system . . . will be necessary if we plan a long tenancy of the earth."

Toward Innovations for the Pursuit of Human Welfare

"Why quarrel with success? Why not just keep on with what we have been doing?" Because, says Kenneth N. Hoffman, Chairman of the Commission on M.I.T. Education, "making changes at critical times is in a way the open secret of M.I.T.'s success." And the changes we make today, he says, should be calculated to make M.I.T. "an environment for learning in which the pursuit of knowledge is guided by a concern for human welfare."

In a special statement to alumni officers anticipating discussion of the Commission's task at the 1970 Alumni Officers' Conference in Cambridge on October 16 and 17, Professor Hoffman lists four reasons why M.I.T. must once again consider basic change in its activities and methods:

◇ Though university governance used to be only the business of trustees, administrators and—occasionally—faculty, there is now "a widespread concern for the right to be heard and the right to participate in decision making," says Professor Hoffman. Hence his suggestion that "the turmoil we have recently experienced makes it imperative that we redefine the rights and responsibilities of membership in the community."

◇ Professional fields and responsibilities are changing; for example, writes Professor Hoffman, "some of the most creative work in the sciences now arises out of the integration of disciplines and the transfer of patterns of analysis from one discipline to another." Hence his suggestion that "traditional educational objectives need to be rethought and reformulated," that M.I.T. should have "a facility for 'reasoned opinion,' a style of thinking in which values are related to facts by the application of logic and the skills of advocacy."

◇ The prospect of reduced funding for both education and research from federal sources in the coming years brings M.I.T. new responsibilities which "will force the Institute to exercise greater internal control over the initiation and continuation of research projects" and, perhaps, to make other "adjustments in practices and planning."

◇ Just as M.I.T., in the past, has responded to industrial and then military needs of the U.S., so now, writes Professor Hoffman, it must "take a leading role in . . . a profound national effort to transform American national goals. Instead of being entirely preoccupied with economic growth and military power, the U.S. may be on the way toward a recognition that we have other problems at least as serious, such as the danger of nuclear war, the continuing social evils of poverty, illiteracy, and crime, the threat of overpopulation and pollution, and the fate of the environment. . . . M.I.T.'s leadership in education and research must depend, in part, on our

willingness to make our talents and capacities available for efforts to understand and cope with this wide range of pressing social problems."

A Correction

In its report of the appointment of an alumni advisory committee to the Commission on M.I.T. Education (*Technology Review* for July/August, p. 83), the *Review* erred in two respects. The name of Howard O. McMahon, Ph.D.'41, was omitted; and his title, President of Arthur D. Little, Inc., was assigned instead to Paul V. Keyser, Jr., '29. Mr. Keyser is a former Vice-President of Mobil Oil Corp. who is President of the M.I.T. Alumni Association.

Architecture: From Aesthetic to Advocate

Architectural education used to be bricks and mortar, cubic feet and setbacks, foundations and structures, materials, textures, and colors. It is still all these things—and now it is more: the interrelations of buildings and groups of buildings and their environment, and the interrelations of buildings with their users.

The issue, says, Hans Harms, Director of the M.I.T. Department of Architecture's Community Projects Laboratory, is "to understand the relationship between the physical environment and life in it."

C.P.L. begins its third year this fall as a laboratory for architecture and planning students and their teachers to work with the people who will use the buildings they design—especially low-income groups, for whom the architects serve as "advocate-planners."

The purpose is to open "learning opportunities" both for students and for low-income residents—"to explore the relationship between the life of low-income communities and the nature of the space in which it occurs," as Mr. Harms has written in the Department of Architecture's periodical *ReseARCH*.

In two years since its founding, C.P.L.—with modest funds from the National Endowment for the Arts, the Ford Foundation through the Urban Systems Laboratory and the Mellon Foundation—has brought architecture faculty and students together on a number of projects involving work with local groups as "clients:"

◇ The design and construction of six community playground/parks in the South End, Roxbury and Somerville. In a two-year period so much has been learned about how to design and build such recreational centers that—once the parts have been prefabricated to a community plan—a vacant lot can be converted into a playground/park in a single day of community action. Two students are now working on a film to document this learning experience for other groups—and to help in its evaluation.

◇ Developing and building a "youth cen-

ter" in suburban Sudbury, Mass., in which Robert Goodman, Assistant Professor of Architecture, and several M.I.T. students studied with a group of high school students and their teacher what would make a really effective meeting place for young people who found the school environment too formal and restraining. They ended up designing and building together a flexible space in the basement of a Sudbury town building, and in the course of the week Joan R. Fleischnick—one of the M.I.T. student participants—wrote, "I have never worked on a project that was so closely related to the people that were going to use the space. I've learned the importance of allowing the users to contribute in the decision-making process."

◇ An ambitious program to help tenants in two apartment houses in Boston's South End organize to save their buildings from destruction by the Boston Redevelopment Authority as a site for a new school, to rehabilitate them, and to organize a tenants' cooperative to purchase and operate the improved apartments. So far there have been studies for alternative land use plans in the area of the buildings, necessary to convince the B.R.A. that the buildings can be saved and the school built adjacent to them; a plan for the residents themselves to join with architecture students in designing the rehabilitation; formation of the Columbus Avenue Tenants Association to represent more than 100 low-income families who now live in the apartments (rents, \$50 to \$75 a month); and preliminary work to develop a financing plan for the rehabilitation and purchase by C.A.T.A. The principal issue here, says Mr. Harms, is "to develop strategies whereby low-income people with little experience or capital can assume the responsibilities of owning and managing the environment in which they live." He believes that if the C.A.T.A. experience can be successful it can become "an extremely potent model for community development and low-income housing" which could be "widely applied in the low-income areas of this country's urban centers."

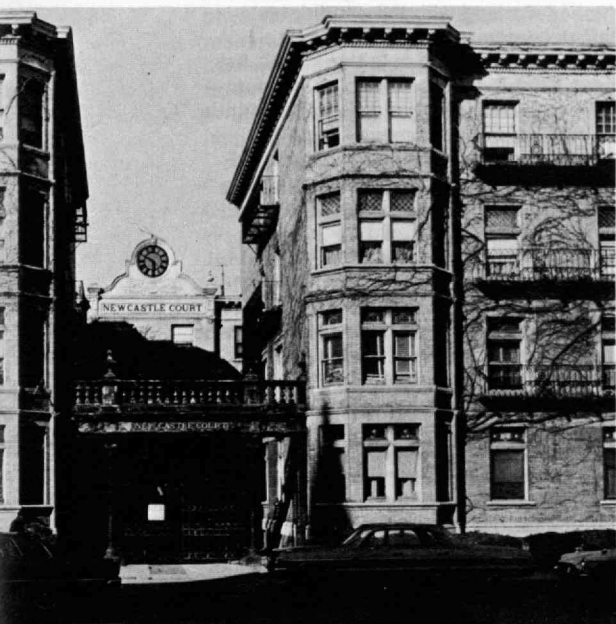
◇ A resource center gathering information and experiences on new ways to relate the skills of architects and planners directly to the needs of low-income communities. Cooperative housing rehabilitation will be an important part of this activity; another will be the new relationship between architect and client which is necessary when the client is in fact not the financial sponsor but the true user of the property. The ultimate goal is a library of relevant materials, including case histories, as well as a continuing organization of faculty and students who can respond to calls for help.

"Advocacy Planning"

The basic philosophy of all these activities, says Mr. Harms, is to develop a new concept of the relationship between architect and "client," contained in the new phrase—advocacy planning. Instead of the traditional plan with client providing problem and money and architect

More than 100 families live in Newcastle Court and the Saranac Building on Columbus Avenue in South Boston. The buildings are structurally sound if superficially dilapidated, the tenants relatively permanent (average—seven years.) Can staff and students of M.I.T.'s Community Projects Laboratory help the tenants plan for cooperative ownership and rehabilitation of these buildings, saving them from demolition by the Boston Redevelopment Authority to make way for a new school which could be built on adjacent land? The first stage is to show that school and buildings can coexist on the site, a proposition proved by several alternative plans sketched by M.I.T. architecture students for presentation to B.R.A.; one is reproduced below.

Then came detailed studies, in cooperation with tenants, to see how the buildings could be improved without making major structural alterations. One requirement agreed upon by tenants and architects was that rentals in the rehabilitated buildings could be only modestly higher than the \$50 to \$75 figures which tenants now pay. Accordingly, the C.P.L. and tenants groups studied alternative rehabilitation budgets and financing arrangements.



providing the solution, advocacy planning presumes that the architect works *with* people—rather than *for* them—to reach the solution.

The architect has to help define needs and make solutions possible, and he must do this through a dialogue in which architect and people see themselves as equals, each educating the other as to requirements and possibilities. Hence the architect's involvements in political issues, and his emphasis on the user's interests and desires.

"We hope to use buildings as a means to an end," says Mr. Harms, "an end which is the development of a community which is more capable of dealing with its own problems and potentials, using its present resources and directing them toward a realistic and meaningful goal."

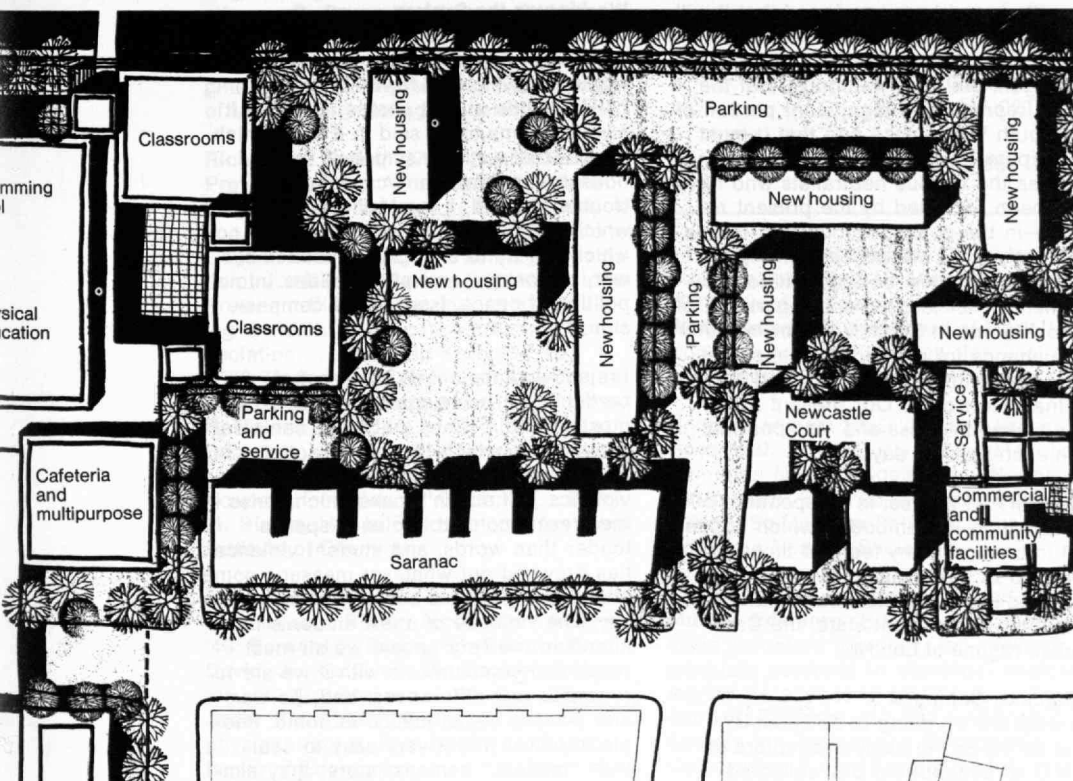
Peace Summer 1970: After the Bell Tolls

This is Headquarters. But the room is empty—except for one student talking on a telephone. In the next room someone is pecking at the keys of a typewriter. The floor is littered with mimeoed press releases that smudged. The ice box is nearly empty.

The scene could be the office of any student campus organization in summer—a college newspaper, yearbook, or drama club. But this organization, the Movement for a New Congress (see *next page*), is not on campus, and it is a drama club in only the broadest sense. Nevertheless, it—too—is a partial victim of the July-and-August lull.

M.N.C. started during last May's national eruption of student political activity after U.S. involvement in Cambodia (see *Technology Review for May*, pp. 82-84). Like other action groups founded then, M.N.C. achieved a huge (100,000) national membership almost overnight—as well as some national and local organization.

In June the M.I.T. office, which later became the Eastern Massachusetts Chapter endorsing three primary candidates, had a list of 10,000 students attending college in its region who wanted to work on political action; this boiled down to a list



of 2,500 who would spend the summer in the area, and of these some 600 actually came out and worked for M.N.C.'s three candidates. But 200 students per candidate, says staffer Robert A. Schaeffer, '69, could be enough to make the difference.

The summer lull was broken by a few bumps as well as some success. One came when M.I.T. concluded that political groups making "substantial" attempts to influence legislation or intervening in a "political campaign on behalf of any candidate for public office" and whose activities extended beyond the campus should not be housed in Institute facilities. To have such groups in campus buildings would be to risk the Institute's tax-exempt status. So M.N.C. moved into a nearby industrial site.

The Movement for a New Congress came through the summer doldrums better than other collegiate political-action organizations. The New England Regional Information Center, a nonpolitical information-giving group which in May coordinated the activities of 800 sub-groups, was reduced to a sleepy rump session in a room full of telephones at M.I.T.

One strong new group emerged during the summer: the Universities National Anti-War Fund, proposing to raise substantial sums to support candidates of its choice in primary and final elections throughout the U.S. By the end of August it had raised about \$110,000 to support the campaigns of anti-war candidates who face close elections in November.

Robert Saner of U.N.A.F., who will resume studies at the Harvard Law School this fall, says the principal fund-raising effort will come only in September. He and Mr. Schaeffer agree that the heat of battle will rise as elections approach, and both are sure that their groups are ready for the job of flushing out help for those for whom the bell tolls.

Movement for a New Congress: Working On—Not In—the System

by Steven C. Carhart, '70

The following commentary was written for Technology Review by a principal organizer of the M.I.T. chapter of the Movement for a New Congress (see above). Mr. Carhart, a former editor of The Tech, is President of the M.I.T. Class of 1970; he majored in electrical engineering and this fall returns to the Institute to enter the new graduate program in the social applications of technology in the Sloan School of Management.

Hundreds of thousands of students canvassing for carefully selected antiwar and civil rights candidates in this fall's congressional elections is the goal of the Movement for a New Congress, which now has chapters on many American campuses and in which M.I.T. students and faculty had an early—and leading—role.

M.N.C. is one of a number of continuing organizations born in the days following the U.S. invasion of Cambodia. The Movement originated at Princeton. It is based principally upon opposition to the Vietnamese war and its extension into Cambodia, but the Movement embraces as well "liberal" positions on other issues before the country: civil rights, defense research, and national priorities.

Toward Rational Politics in Vietnam

Why does M.N.C. oppose administration policy in Vietnam? Because we believe that "Vietnamization" does not resolve the political issues in South Vietnam and is therefore at best a formula for replacing U.S. soldiers with South Vietnamese soldiers paid for by us. In the days before official euphemisms, such soldiers were called mercenaries. Regardless of how we describe such a policy, however, it will not stop the fighting. Only the color of the corpses will change.

In addition, there are grave doubts about whether such a program will work. While I have no knowledge of the present situation in Vietnam beyond that which I obtain through the media, past events have given me a profound faith in the general incompetence of the Saigon regime. I simply cannot accept promises from Washington that the Saigon generals will have enough competence and support from the Vietnamese to govern the country without continued U.S. military and economic aid—much less the statesmanship to run a government which is other than an authoritarian dictatorship.

It is irresponsible to oppose a policy without offering an alternative. After 11 years of American effort and countless escalations of military and civilian influence, the basic political question—the governance of South Vietnam—remains unsettled; and I am convinced that it will remain so as long as we persist in attempting to prop up the Thieu-Ky regime in Saigon. We must recognize that the N.L.F. represents a significant portion of the South Vietnamese and that it must participate—along with other groups, such as the various neutralists who have also been excluded by the present regime—in the political process of the nation. Only when we accept some plan which permits this, be it a coalition government or a "leopard-spot" partition of various areas in South Vietnam, will there be a chance for peace, political settlement, and withdrawal of U.S. and North Vietnamese troops. Our present policy only makes this less and less possible with each passing day.

All of this, of course, is independent of the situation in Cambodia, which appears still to confirm many fears of those who objected to the invasion. We may have captured some supplies, but we also acquired a new client state, the Cambodian regime of Lon Nol.

Politics by Computer

So what are we going to do about it? Last spring all the campus chapters of M.N.C. throughout the U.S. collected

names of students who volunteered to canvass for peace candidates during the summer and in the fall. At M.I.T. alone, in less than two weeks, we enrolled over 800 undergraduates. Since students move around over the summer, we collected both summer and school addresses. This information, along with data on each volunteer's political experience, was stored on tape for easy computer access.

Decisions about which candidates to support are being made by regional offices of M.N.C. in consultation with campus chapters and local peace action groups. In Boston, for instance, a peace caucus was held late in June for M.N.C. and other groups interested in canvassing. As desirable congressional candidates are identified, each regional office is working with the candidates' staffs to organize volunteers—and a prime source of names is the M.N.C. list now sorted in the computer by the summer addresses. The process will continue this fall, when our computers will be sorting names according to campus addresses and when the campus chapters will be in operation to find additional volunteers.

M.N.C. has also been making throughout the summer a large research effort to identify close congressional races in which there is a real difference between the candidates. Our intent, of course, is to ensure that we will not squander our resources in races where our help cannot make any difference. By fall we expect to have a better feeling for which races will be the most critical. Then, during the last two weeks before the election, we intend to send large numbers of canvassers into key districts. Local chapters and regional offices will organize transportation and lodging.

Working on the System

In describing our activities, the general press has characterized us as "working within the system." I have always rebelled a little at that phrase, because it always seems to be said in a tone which implies that we have somehow been housebroken and won't cause any trouble. Instead, I see M.N.C. as an agent which works *on* our system, an agent which will try to change our politics of war, patronage, and personalities into a politics of peace, issues, and compassion.

I reject violence not so much out of particular scruples against its use (I, like most people, believe that there can exist situations in which the use of violence in a just cause is appropriate) but because violence just doesn't make much sense in the present context. Violence speaks louder than words, and student violence has drowned out whatever message some students might have been trying to convey. The violence of a few students has alienated the very people we all must reach and communicate with if we are to reconcile our differences, end the war, and achieve social justice at home. People in power find it very easy to deal with "militant" demonstrators; they sim-

ply call in the police and gain the support of much of the general public.

But M.N.C. will be tougher to deal with for this administration which manipulates the fears of the American people for its political ends. Between now and the elections—and thereafter—we intend to convince enough people to reject policies of war abroad and fear and prejudice at home so that the nation's objectives can be reoriented, so that we can all do more to build a nation we can all be proud of.

Individuals Noteworthy

To **John W. Beretta**, '23, the 1970 Award of a Distinguished Engineer by the National Society of Professional Engineers . . . **John R. Uglum**, '60, as one of 50 physicists in the United States whose research in 1969 was of outstanding achievement by the American Physical Society . . . **Sanford R. Greenfield**, '52, to the College of Fellows of the American Institute of Architects

George P. Shultz, '49, to director of the Office of Management and Budget, Washington, D.C. . . . **Howard W. Johnson**, President of M.I.T., to the productivity panel of the Council of Economic Advisers by President Nixon . . . **Arnold F. Stancell**, '62, to visiting associate professor of chemical engineering at M.I.T. . . . **Douglas L. Brooks**, '43, to special assistant to the director of the National Science Foundation

George M. Zriny, S.M.'65, to Comptroller of Bell Laboratories . . . **Chester F. Buckley**, '26, President of American Gage and Machine Co., to Board Chairman of AGM . . . **Joseph A. Polack**, S.M.'43, Director of Esso Research Laboratories to Head of the Department of Chemical Engineering of Louisiana State University . . . **D. Bruce Henderson**, S.M.'43, Rear Admiral, U.S. Coast Guard, Retired, to Chairman of the Department of Engineering and Engineering Technologies of Montgomery College, Rockville, Md.

Richard H. Ewert, '37, to Senior Vice-President of the American Gear Manufacturers Association . . . **A. F. Frederickson**, Sc.D.'47, to member of the National Council of the National Planning Association . . . **Harry A. Carter**, S.M.'42, to Vice-President-Elect of the Industrial Marketing Division, American Marketing Association . . . **E. Philip Kron**, '34, to 1970-71 President, National Association of Purchasing Management . . . **Thomas F. Malone**, Sc.D.'46, to Deputy Foreign Secretary, National Academy of Sciences . . . **Robert L. Sinsheimer**, '41, to National Academy of Sciences Council . . . **Barry M. Bloom**, '48, to Fellow of the American Institute of Chemists.

New members to the National Academy of Sciences: **Robert McCormick Adams**, '46; **Bernard F. Burke**, '50; **Edward E. David, Jr.**, Sc.D.'47; **M. Stanley Livingston**, M.I.T. Professor of Physics; **Alexander Rich**, M.I.T. Professor of Biophysics; **Paul A. Samuelson**, M.I.T. Professor of Economics.

Reunions 1971

60th	'11	Oberlin S. Clark 50 Leonard Road North Weymouth, MA 02191	M.I.T. Campus
55th	'16	Ralph A. Fletcher Box 71 West Chelmsford, MA 01863	Chatham Bars Inn Chatham, Mass.
50th	'21	George Chutter Boulder Drive Box 305 East Dennis, MA 02641	M.I.T. Campus
45th	'26	Donald S. Cunningham 35 Talbot Street Braintree, MA 02184	Chatham Bars Inn Chatham, Mass.
40th	'31	Ralph H. Davis 66 North Street Lexington, MA 02173	Bald Peak Colony Club Melvin Village, N.H.
35th	'36	Not Selected	Not Selected
30th	'41	Edward R. Marden Edward R. Marden Corp. 280 Lincoln St. Allston, MA 02143	M.I.T. Campus
25th	'46	Edwin Tebbetts N.E. Mutual Ins. Co. Actuarial Dept. 501 Boylston Street Boston, MA 02117	M.I.T. Campus
20th	'51	Jay Rosenfield 3 Bartlett Street Marblehead, MA 01945	Provincetown Inn Provincetown, Mass.
15th	'56	William S. Grinker 21 Woodward Road Framingham, MA	Harbor View Hotel Edgartown, Mass.
10th	'61	Dr. Jerome H. Grossman Massachusetts General Hospital Lab of Computer Sciences Boston, MA 02114	Not Selected
5th	'66	Not Selected	Not Selected

To **Howard O. McMahon**, Ph.D.'41, President of Arthur D. Little, Inc., the 1970 Award to Executives and to **Robert W. McKinley**, '40, the Award of Merit, both from the American Society for Testing and Materials.

Harry Pearlman, Ph.D.'39, and **Murray W. Rosenthal**, Sc.D.'53, to directors of the American Nuclear Society . . . **Norman C. Rasmussen**, Ph.D.'56, and **Edward A. Mason**, Sc.D.'48, to Fellows of the American Nuclear Society.

To **Thomas B. Jones, Jr.**, '66, and to **Murray Edelberg**, S.M.'67, the Supervised Investors Services, Inc., Awards to graduate students in electrical engineering for excellence in teaching . . . To **Marc H. Richman**, '57, the American Society for Engineering Education's Outstanding Young Faculty Award.

To **William B. Spencer**, '15, the Engineering Society of Baltimore's 1970 Founders' Award . . . To **J. Howard Pew**, '03, the William Penn Award of the Philadelphia Chamber of Commerce.

To **Gordon S. Brown**, '31, **William M. Pease**, '42, and **James O. McDonough**, '43, the Numerical Control Society's Jacquard Award . . . To **Robert Rediker**, '47, the David Sarnoff Award of the Institute of Electrical and Electronics Engineers . . . To **Harold E. Edgerton**, '27, the Michelson Medal of the Franklin Institute . . . To **Charles D. Coryell**, M.I.T. Professor of Chemistry, a citation from the Atomic Energy Commission . . . To **Paul A. Feldman**, '61, an essay award from the Gravity Research Foundation, New Boston, N.H. . . . To **Charles Stark Draper**, '26, the Department of Defense Distinguished Public Service Medal.

To **Richard H. Pough**, '26, an honorary Doctor of Laws degree from Haverford College . . . To **Crawford H. Greenewalt**, '22, and to **Athelstan Spilhaus**, S.M.'33, honorary Doctor of Science degrees from Hamilton College . . . To **Luis A. Ferre**, '24, and to **Thomas D. Cabot**, honorary doctorates from Harvard University . . . To **C. Lalor Burdick**, '13, honorary Doctor of Laws degree from Drake University.

Alumni Calendar

Boston—October 8, Thursday, 12:15 p.m.—Luncheon meeting, Aquarium Restaurant. Speaker: Erwin D. Canham, Editor in Chief, *Christian Science Monitor*. Topic: Election 1970.

—October 14, Wednesday, 6 p.m.—Dinner meeting, M.I.T. Faculty Club. Speaker: Roland B. Greeley, Director of Admissions at M.I.T. Topic: criteria for college admission.

—November 12, Thursday, 12:15 p.m.—Luncheon meeting, Aquarium Restaurant. Topic: a report from the Commission on M.I.T. Education.

Cambridge—October 16-17—National M.I.T. Alumni Officers Conference.

—October 23-24—The Department of Chemical Engineering will celebrate its 50th Anniversary with a two-day Convocation, open to M.I.T. Course X alumni, students, and faculty. For reservations

and more information call the M.I.T. Alumni Association, (617) 864-6900, extensions 3768 and 7200.

Columbus, Ohio—September 25, Friday, 6:45 p.m.—Third annual clambake, Berwick Party House, 3250 Refugee Road.

Los Angeles—September 1, Tuesday, 6 p.m.—Dinner meeting, Athenaeum, Caltech Faculty Club. Inspection of the Clean Air Cars and meeting with the entrants of the Race will take place at 5 p.m.

Class Reunions—June 5-6, 1971

Homecoming—June 6-7, 1971

Deceased

Joseph W. Ames, '98, February 11, 1969
Edwin Kuttroff, '98, February 11, 1969
Horace S. Baker, '03, April 29, 1970*
Walter P. Regestein, '03, April 4, 1970*
Walter G. Eichler, '05, July 5, 1970
T. Herbert Files, '05, May 5, 1970*
Elmer D. McCain, '06, July 1, 1970
Otis G. Fales, '07, May 2, 1970
Donald G. Robbins, '07, July 10, 1970*
Hardy Cook, '09, May 22, 1970*
Joseph H. White, '09, January 10, 1970
John M. Bierer, '10, July 8, 1970*
Phillip T. Harris, '10, August 9, 1970
William J. O'Hearn, '10, August 12, 1970
Prescott K. Wadsworth, '10, April 12, 1970
Prescott V. Kelly, '13, June 1, 1970*
Louis W. Currier, '14, June 23, 1970*
William Mellema, '15, August 7, 1970

Henry J. G. Rudolf, '15, August 8, 1970
Louis H. Zepfner, '15, August 18, 1970
Meade Bolton, '16, November 24, 1968
Hovey Freeman, '16, July 23, 1970*
Harry Lavine, '16, April 27, 1970
Leslie Groves, '17, July 3, 1970*
Harold Collins, '18, July 7, 1970*
Helen Kleinschmidt, '18, December 3, 1969
John H. Coyle, '20, May 17, 1970*
Merrill B. Knox, '20, June 7, 1970
Gordon Nelson, '20, September 10, 1968
Oscar P. Young, '20, July 30, 1970*
John S. Cummings, '21, June 16, 1970*
Palmer W. Griffith, '21, July 27, 1967
Gordon M. Leland, '21, July 2, 1968
Raymond C. Buell, '22, May 2, 1970
Jack Kellar, '22, June 29, 1970*
Jack Liecny, '22, May, 1970*
Avery A. Ashdown, '24, July 15, 1970*
Theron P. Bailey, '24, July 18, 1970*
Nicholas Alexander, '29, April 25, 1970
William I. Gorfinkle, '28, August 14, 1970*
Thomas A. Grant, '31, June 14, 1970
Ina M. Curley, '32, January 5, 1970
Louis Birchall, '35, May 19, 1970
Edward Loewenstein, '35, July 12, 1970*
Archver Nicholas Ahmadian, '37, June 25, 1970*
Michael M. Irvine, '38, July 17, 1969
Marshall E. Turnbaugh, '45, August 4, 1970
Claude F. Martin, Jr., '52, September 7, 1967
Charles H. Nute, Jr., '52, June 9, 1970
Herbert J. Platt, '52, November 28, 1968
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mint of the wealthy Croesus has recently been unearthed; as well as CORINTH, EPIDAUROS, IZMIR (Smyrna) the BOSPORUS and DARDENELLES. The cruise through the beautiful waters of the Aegean will visit such famous islands as CRETE with the Palace of Knossos; RHODES, noted for its great Crusader castles; the windmills of picturesque MYKONOS; the sacred island of DELOS; and the charming islands of PATMOS and HYDRA. Total cost is \$1299 from New York. Departures in April, May, July, August, September and October, 1970.

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Class Review

91

Congratulations are in order for **Harrison I. Cole**, of North Pembroke, Mass., on the celebration of his 100th birthday this August.

Richard K. Baltzer, '31, sent the *Review* the following note: "I would like to call to your attention the fact that one of M.I.T.'s oldest alumni, of the Class of 1891, has just celebrated his 100th birthday. . . . He was born August 23, 1870; he is in good health and is still active and alert." Mr. Baltzer also reports that Harrison was the delighted recipient of a birthday card from President Richard Nixon.—Eds.

95

Homecoming was a very pleasant experience and I was glad to be able to be present!

A sincere thank you to all the young men and women who so willingly offered their help with the wheel chair. A special thank you to the lovely young blonde who got the chair for me and whom I understand was leaving for Europe the next day. Thanks to Mr. Mattill and Miss Kelley for their gracious hospitality. It was good to have John Nolan, Secretary for the Class of 1903, at our table.

Thanks to Fearing Pratt, Don Severance, and Philip H. Peters for stopping by our table for a greeting.

As usual I am grateful to Dike Arnold for driving me home.—**Andrew D. Fuller**, Secretary, 1284 Beacon St., Brookline, Mass. 02146

96

Some months ago this column reported the opening of the Fuller Memorial-Brockton Art Center which was made possible by the bequest of your classmate, **Myron Fuller**, to his native city. A report from this unique institution states: "In the few months since its inception, the Museum has won the admiration of thousands of visitors from all corners of New England and beyond.

They have expressed their feelings of wonder with some envy. The architects, J. Timothy Anderson and Associates received the Civic Building award of the American Society of Registered Architects for the functional and attractive buildings. This fall the art students from neighboring Stonehill College will use the faculty and facilities of the museum to supplement their courses in theory and history of art."—**Clare Driscoll**, Acting Secretary, 11 Cliff St., Plymouth, Mass. 02360

98

At M.I.T. in September the freshmen were pouring in. If you remember when, as freshmen, you were required to drill under Instructor Captain John Bigelow, Jr., of the U.S. Army, you will also recall the annual freshmen's competitive drill of May, 1895, in the South Armory on Irvington St. Company C of the four '98 companies took first prize in that competition and so was qualified to compete later with Harvard. That competition was also won by Company C. The Company's picture taken outside the Armory shows a count of forty-six men. **Joe Riley** was first lieutenant. As long as we're reminiscing, let's not forget the Class Yell:

Ninety-eight, ninety-eight, rah rah—
rah rah
Ninety-eight, ninety-eight, rah rah—
rah rah
Hoo rah—hoo rah
M.I.T. ninety-eight—rah rah rah.

While you are in this peppy mood, please have your family read this and write me something about you and themselves.—**Mrs. Audrey Jones Jones**, Acting Secretary, 232 Fountain St., Springfield, Mass. 01108

02

I am able to offer a few items of interest this month. **Arthur Collier** and Mrs. Collier attended the Alumni Day exercises last June; they were the sole representatives of our Class.

I have to report the death of two classmates, news of which came to me belatedly. **Clifford B. Clapp** died in Shirley,

Mass., on September 5, 1969. Clapp was for a long time with the University of Pennsylvania in the library department. **James J. Mahar** died January 28, 1970. He was for many years with the Department of School Buildings of the City of Boston.

A letter from **Carlton B. Allen** received earlier this year stated that he and his wife were both enjoying good health, though his eyesight is not as good as it might be. He no longer drives a car, but is able to walk and is still a bank trustee.—**Burton G. Philbrick**, Secretary, Greycroft Inn, 68 Dane St., Beverly, Mass. 01915

03

Well, distinguished classmates of M.I.T., relaxing in the sombre atmosphere of Florida beaches and California coast line, our remote New England's torrid summer is over and we are eager for its fall zephyrs.

Thomas M. Lowe, Jr., '25, Course VI kindly writes: "On a recent visit to Gainesville, Fla., I visited with my long-time friend **Louis B. Rapp**, Course III. He is up and about yet would enjoy hearing from his classmates. His address is 2901 N.E. 17th Terrace, Gainesville, Fla., c/o H. D. Loucks. When I have been out of Tech 67 years, I hope someone will remember me. In the meantime, I can be reached at Thomas M. Lowe, Jr. and Associates, 1920 Monroe Drive N.E., Atlanta, Ga. 30324."

Fred A. Olmsted, Course X, from 277 Miller Ave., Mill Valley, Calif., writes: "(I have intended) to write my autobiography to our classmates for a long time. Will do it soon, for I am in good health and enjoy reading our class notes each month in the *Review*."

Paul R. Parker, Course XIII, writes from Kennebunk, Maine: "Am still enjoying my retirement and always interested in reading the experiences of our classmates in the *Review*. However, I wish to hear more, while our members are so fortunate (as) to be active."

Mrs. Mary K. Regestein writes: "The sudden death of 'Reggy,' a devoted

classmate of 1903-M.I.T. (**Walter P. Regestein**) occurred April 2, 1970. He had been in good health for some time previously but his memory became bothersome; that conflicted with (the) reading that he constantly enjoyed. 'Reg' then suffered a stroke that our best care and that of skillful medical attendance was unable to overcome.

"We would have been married 60 years this September and enjoyed our long happy companionship. He adored our three daughters, two of whom live near by in Wilmington, Del., and are a great solace to me now, to overcome his sudden absence."

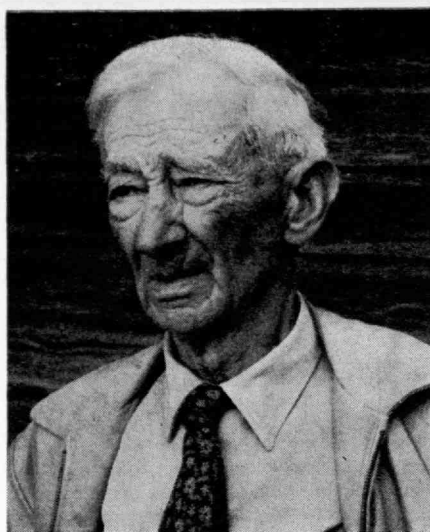
Mrs. Barbara (Baker) Fawcett of Cranbury, N.J., writes: "I am sorry to have long delayed in writing you of the death of my dear father, **Horace S. Baker** and a devoted member of your Class. It occurred April 29, 1970, at the wonderful age of 91. 'Dad' was mentally clear up to his death and keenly interested in all M.I.T. news. However his failing eyesight of late made it difficult for him to keep abreast of his correspondence. I trust this information may be of some interest to his classmates."

James W. Welsh, Course VI, has now left his Florida homestead, to enjoy his final retirement with Mrs. Welsh near his two sons, at equally enjoyable surroundings: 4800 Fillmore Ave., Alexandria, Va.—**John J. A. Nolan**, Secretary-Treasurer, 13 Linden Ave., Somerville, Mass. 02143

05

Our 65th reunion could not be considered as gratifying as our previous five-year reunions, but from a standpoint of good fellowship was very satisfactory. We didn't do too badly on attendance either. Eight men out of 33 now living is quite remarkable, considering that two-thirds of our living members are outside of New England. Including wives and guests we had a total of 20. Present were: **Bernice and Leonard Cronkhite**, **Elizabeth and Gilbert Tower**, **Elizabeth Babcock**, **Harry Charlesworth**, **Mildred Stevenson** and guest, **Charlie Mayer**, all the way from California with guests including his daughter Mrs. George Gow, her husband, and Charlie's granddaughter Marylyn Gow (the Gows have been with us at other reunions), **Izzy Nye** and daughter, Mrs. Jaffe, **Henry Buff** and guest, **Arthur Balkam**, and Ruth and your Secretary, who, by the way, was celebrating his 35th anniversary as Secretary. I suggested that nominations for a new secretary were in order and was rewarded with silence. It has been a very satisfying experience for me and I hope I may continue for quite a spell yet.

Distance and a few disabilities prevented a larger attendance, but the fact that we had several more than other classes in our chronological vicinity attests to the fact that the spirit of '05 is still high. I was amused at **Lloyd Buell's** letter of



Errett Graham, '05, canoeist

regret. He added, "but please do not fail to let me know about the plans in 1975."

I have had two inquiries as to what the picture of **Errett Graham** and his canoe in the June issue meant. Perhaps some remember in the November, 1966, issue (I quote): "I've been too busy grading a new road on the place to have time for my favorite diversion—canoeing. However, the last time I paddled over to the County Commissioner's meeting at Friday Harbor, I returned the long way around thus mapping the 20-mile circuit of the island. The time before, the fog closed in on me and I could see no land for an hour but I could see where the sun was and so didn't get too far off course; the time before that it rained all the way home. But these are all pleasant memories." When you look on your map, find Shaw Island (Washington) and Puget Sound, you will realize this was quite a feat for an 89-year-old man. He was 93 last June. Now you understand about the canoe. His picture (above) taken this spring may help you recognize him. His letter of April 27, 1970, gives this story which I quote because we had had little news of him for many years. "As to a biographical sketch, when I retired 41 years ago from railroad work in Indiana, we moved out here to the extreme northwest of Washington where land surveying has kept me busy since. Prior to that I have a memory of many years working for the Baltimore and Ohio R.R. in surveying and construction work, grading, bridges and tunnels, also on a new road (the Carolina, Clinchfield and Ohio) and three years in the Chicago office of the Chicago, Indianapolis and Louisville, Ky. This was interrupted by my years at Boston Tech and a trip around the world. I won't forget a hot-air balloon trip and a parachute drop. Hope this recital doesn't annoy you." Far from it, Errett. Perhaps it will encourage some of you classmates to do likewise.

Arthur H. Howland, Course IV, an infrequent correspondent, writes that for some months he has suffered from "tic douloureux," a face ache which has

been "vicious" and apparently of long duration. His address is 15 Winter St., Holliston, Mass. 01746.

Gilbert Tower recently received from the selectmen of his hometown, Cohasset, Mass., an acknowledgment of his many contributions to the town over a long period of years and has been named "Honorary Town Engineer."

With the death of **Bob McLean**, we have no Class Agent. Anyone wish to volunteer?

Hub Kenway in reporting the death of **Herman Gammons** (June, 1970, issue) commented that he and Gammons were in the Patent Office in Washington together from 1908 to 1912, together with George Jones and Gorham Crosby and that he had been bumping into Herman professionally in Boston ever since. Hub also reports that **Doc Lewis** has had a successful cataract operation.

I have to report several losses by death. **James S. Brown**, Course II, died on March 3, 1969, at Scarsdale, N.Y. We have no further information.

Walter G. Eichler, Course II, died in Hyannis, Mass., on July 5. He had been hospitalized since April 20. The immediate cause was pneumonia, but Walter had patiently suffered from partial paralysis for many years.

Carlton E. Atwood, Course VI, died on April 21, 1970. His wife, Anne, who has attended many five-year reunions writes: "After all, how many people attain the ripe old age of nearly 88 and enjoy every minute of life—happily planning more and more trips, always looking forward; how many experience the full mental vigor that was his right up to the last instant he drew breath." Carl and Anne were globe-trotters, carrying the study of graphology to several lands. I had hoped he would put his studies into writing, but apparently he did not stop long enough to do it. He was president of the American Graphological Society.

T. Herbett Files, Course II, died on May 5, 1970, at his son's home in Plymouth. Those of us who saw Bert at Alumni Day 1969 thought that perhaps we might not see him on another Alumni Day. Bert had lived in Hingham, Mass., most of his life, but in recent years had been with Dick and Cheri in Norwell or Josephine in Carlisle. Many of his last working years were spent in property management in Boston. Gilbert and Elizabeth Tower attended the funeral. We shall miss him greatly.—**Fred W. Goldthwait**, Secretary, Box 32, Center Sandwich, N.H. 03227; **William G. Ball**, Assistant Secretary, 6211 Fordham Plaza, Bay Shore Gardens, Bradenton, Fla. 33505

06

Several older secretaries, like yours, had no notes in the July-August *Review* and

I imagine all for the same reason—no news! We do not have much for this one, but have heard recently from our President, **Stewart Coey**. He and Betty were as usual, at their attractive cottage on Squirrel Island in Boothbay Harbor, Maine, where Marion and I "ferried in" some years ago to see them. Stew said they will stay at the Wilmington address until the house is sold. "Then we will migrate to the Boston area."

We have one address change to report; **Alf E. Anderson**, Course II, c/o Mrs. Alf E. Anderson, Jr., 135 Old Main St., Marshfield Hills, Mass. 02051.

We regret to report two deaths: **Frank Arthur Benham**, Course I, on September 2, 1968; and **Oscar Stoddard Pulman**, Course X, on October 5, 1968.

In his letter to us Stew Coey said that **Jim Wick** had told them that his wife, Clare, had died. We recall that she had been ill and in a hospital for some years; Jim and their children went to see her frequently. On behalf of the Class we have sent Jim a note of condolence.

Frank Arthur Benham was born May 23, 1883, probably in Milton, Vt., which was his home address. He prepared at the Holderness School in Plymouth, N.H.; he was a member of the Civil Engineering Society and assistant business manager of *The Tech*, '04-'05. His thesis was on the abolition of grade crossing at East Saugus, Mass. Frank's entire career was with the New England Telephone & Telegraph Company with offices on Oliver St., Boston; he resided in Arlington and for many years spent the winter at Daytona Beach. He retired by or before 1948. Frank was a bachelor and we have no record of any relatives.

Oscar Stoddard Pulman, Jr., (B.A.—Ph.D. Yale) was born April 27, 1879, in Albany, N.Y. and prepared at Albany High. His thesis was *Corrosion of Iron and Steel*. "Stod" was with the National Carbon Co. in Cleveland for the first 15 years or so, as chemist, assistant director of research, and assistant superintendent. Roger Babson learned that Stod was keeping some stock records and invited him to head his statistical organization, so Stod and his first wife, Roberta, came to live near us in Wellesley Hills and we soon became good friends.

He retired around 1930 and they lived for some years in New Jersey, then in White Plains, N.Y. Stod remarried and in 1968 we learned that he was in a convalescent home near Glastonbury, Conn., where his second wife was living with her married son, D. J. Jordan.

Marion and I hope you and yours had an enjoyable summer—why not write and tell us all about it and how you are and what you do besides sleep and eat! Our Best to you all from Marion and Ned.—**E. B. Rowe**, Secretary-Treasurer, 11 Cushing Rd., Wellesley Hills, Mass. 02181

07

We regret to report that your Class President, **Donald G. Robbins**, died July 10, after a brief illness. Services were held on July 13, in Providence, R.I.

Don, a term member of the M.I.T. Corporation and a past president of the M.I.T. Alumni Association, was born in Pittsfield, Mass., in 1885 and had been a resident of Barrington, R.I. for over 30 years. He retired in 1950 as director and comptroller of International Braid Company of Providence, R.I. and had been a director of Stanley Woolen Corporation, Uxbridge, Mass. and Newport Electric Corporation, Newport, R.I. for many years.

We offer our sincere condolences to his widow, Sarah Sanborn DeMerritt Robbins, his two sons and step-daughter. He also leaves 9 grandchildren and 9 great-grandchildren.—Eds.

08

This seems to be an interesting change of mind and occupation for **J. Scott MacNutt** of 5067 Westminster Pl., St. Louis, who reports as follows: "I am a semi-retired portrait-painter in St. Louis, where I have lived and practiced my profession for the past 50 years. This may seem a strange report from one who graduated in Course VII (Biology and Public Health) in 1908, was a health officer, researcher, author of papers and two books in the field of sanitation, and served as an officer in the Sanitary Corps. U.S. Army in W.W. I. It is explained by a radical change in profession made at the close of that war. There followed art study in Boston and Paris, teaching at the St. Louis School of Fine Arts and in the Woodbury Course in Observation (Boston and Ogunquit), a year as Associate Dean of the School of Art Institute of Chicago, and several visits to Europe. Thanks to get-togethers of the local M.I.T. club and an acquaintanceship with Tech men in St. Louis and elsewhere, I have by no means lost contact with the Institute. Professor Emeritus Samuel C. Prescott, '94, of the Biology Department, who died recently, was a lifelong friend. Although my ultimate occupation proved to be outside of the technological realm, I have always recognized the value, in all fields, of the faculties of observation and clear thinking in the M.I.T. training."

A note from **Herbert A. Cole, Jr.**, 15 Pleasant St., Hingham, Mass., reports that, "There are few of us left and I search the '08 column in each issue of the *Review* for news. Personally, I am 84, sound as a nut, and my sweetheart and I find (55 years together) very sweet and lovely. Our best to you all."

We have no changes of addresses to report over the summer.—**Joseph W. Wattles**, Acting Secretary, 26 Bullard Rd., Weston, Mass. 02193

09

There were nine of us at the Homecoming luncheon held in the Briggs Cage on Monday, June 15: Chet Dawes, Tom Desmond, Ben and Barbara Pepper, Art and Betty Shaw, Henry and Madge Spencer, and Ed Howe, '10. Alice Desmond accompanied Tom to Boston but remained in their Boston hotel, not feeling able to attend the Homecoming activities at M.I.T. A detailed account of the Homecoming events is given in the July/August *Technology Review* beginning on page 100 and of the program at the luncheon on page 103. Alumni President, Philip H. Peters, '37, presided until he presented the gavel to his successor, Paul V. Keyser, Jr., '29. We heard President Johnson's report and witnessed the presentation of the very large reunion gifts by the several classes, all of which is recorded in detail in the aforesaid *Review*. We all were very pleased that Art has shown great improvement since his accident last fall when he fell from a ladder and we're happy that he and Betty could be with us. We hope we will receive personal news from those who attended the luncheon as well as from other members of the Class.

Probably some members of the Class received the announcement of the Oriental Carnival, a trip to Tokyo and Hong Kong arranged primarily for M.I.T. alumni living in the Eastern United States by the American International Travel Service. Muriel and I decided to sign up, and along with those in the Boston area took off on Friday morning, July 3, to join the rest of the party at New York's J.F.K. Airport. The entire group left that afternoon on Northwest Orient Airlines for Tokyo.

In Tokyo we were entertained by a spectacular all-girl revue at the Kokusai Theater preceding dinner at a Japanese tea house. With shoes removed, we were seated on the floor at low tables where the meal was cooked and served by attractive geisha girls. Forks were provided in case we failed to achieve proficiency with chopsticks. The evening ended with a demonstration of the Japanese tea ceremony and a group of traditional dances.

In addition to the principal points of interest in Tokyo, we traveled through the countryside to visit Kyoto, a former capital of Japan, and Nikko, Japan's most beautiful national park with its mountains, lakes, waterfalls, and numerous elaborately decorated shrines which one may enter only if shoeless. A ride on the "Bullet Train" took us to Osaka for Expo 70 where we enjoyed particularly the American and Soviet pavilions, undoubtedly the most popular ones. Unfortunately, inclement weather prevented our obtaining any view of the well-known landmark, Mt. Fuji. We also visited crowded Hong Kong and its mainland adjunct, Kowloon, going as far as the river which defines the border



Members and guests at this summer's 60th reunion of the Class of 1910. Left to right: Sitting—Alva Court; James Tripp; Chester Wilson; Mrs. Akerly; George Lunt; Herbert Cleverdon; Mrs. Burnett; Carl Sittinger; Alfred Hague;

Barbara Sittinger (daughter) in front. Standing—George Magee; Robert Gray (son); Mrs. Spalding; Walter Spalding; Arthur Curtis; Mrs. Hague; Carl Lovejoy; John Gray; Mrs. Curtis; Harold Akerly; Mrs. Wallour; C. W. Wallour; Mrs. Wil-

liams (guest); Mrs. Wilson; Mrs. Cleverdon; Fred Lutkin; Mrs. Horne; Murray Mellish; Mrs. Mellish; Russell Hastings; Ralph Horne; Robert Burnett; Jack Babcock; Mrs. Sittinger.

with Red China. Another highlight was a visit to Bangkok with its many ornate Buddhist temples. These Eastern cities are not unlike our own with traffic problems, overcrowding, extensive public housing projects and attempts to overcome poverty by encouraging industrialization.

We have received word that **R. E. Blankenbeuhler**, who lives in Elizabeth, Pa., is in a nursing home. We have written him expressing the sympathy of the Class and hoping for a speedy convalescence.

The following comes from **Franklin Hunt**, Burlington, Vt.: "Since my wife's death seven years ago I have been living part of the time with my daughter Barbara in Bethesda, Md. She keeps in touch with her Wellesley friends. The rest of the time I live with my son Allen who is an associate professor of geology at the University of Vermont. My health is still good."

Keyes Gaynor writes from Sioux City, Iowa: "I have closed my office and retired on account of my wife's illness."

Art Shaw, in his notes from Sarasota, has frequently mentioned having met **Hardy Cook** at the M.I.T. Club meetings. Hardy had lived there for 21 years, and of late Art told of his being in a nursing home. Recently in a letter Mrs. Cook told Art of Hardy's death on May 22 and enclosed a clipping. Your Secretary was a very close friend of Hardy's since both of us were in Course VI and played two years on the Class football team. Hardy is in the photograph of the 1909 football team which hangs in your Secretary's game room in Winchester. After graduation he joined the Brooklyn Edison Company which later became Consolidated Edison Company, and we often met at electrical conferences. Hardy was an executive with Consolidated Edison of New York for 37 years before his retirement, a professional licensed engineer in New York, life member of King County Masonic Lodge 511, F&AM of Brooklyn, N.Y., and a member of the M.I.T. Club of South-

west Florida. He leaves his wife Margaret; a daughter, Miss Margery Cook; two sons, Walter Hastings Cook of Briarcliff Manor, N.Y., and Hardy Merrill Cook, Jr. of Baltimore, Md.; one sister, Mrs. Mildred Martin of Milton, Mass.; and five grandchildren. We have written to Mrs. Cook expressing the sympathy of the Class as well as our own and we are having a copy of this *Review* sent to her.—**Chester L. Dawes**, Secretary, Pierce Hall, Harvard University, Cambridge, Mass. 02138; **George Wallis**, Assistant Secretary, Wenham, Mass.

10

I have received notices of the passing away of the following classmates: **Edward O. Scriven** on April 7, 1970; **Prescott K. Wadsworth** on April 12, 1970; **Morris W. Hedden**; **Edwin K. Jenckes** on August 9, 1967; **Tom W. Saul** on April 4, 1967; **James B. Noble** on October 3, 1960; and **John M. Bierer**.

The following is from the *Boston Herald Traveler*: "John M. Bierer, 82, a former rubber company president and Boy Scout executive, died yesterday, July 8, 1970, at his home at 80 Meadowbrook Road, Norwell, Mass. He received degrees from Washington and Lee University and the Massachusetts Institute of Technology where he served as a chemistry instructor. In 1911 he joined the Boston Woven Hose and Rubber Co. of Cambridge and became president in 1951. Following his retirement in 1959 he served as consultant for the American Biltrite Rubber Co. Bierer served on the national executive board of the Boy Scouts of America, was past president of the Norumbega Council and chairman of Region 1. He was national chairman of the Cub Scout and Explorer Scout committees and has been awarded Scouting's high honors, the Silver Beaver, Silver Antelope and Silver Buffalo awards. He served in the Navy during World War I and during World War II, was chairman of the Newton Committee of Public Safety. He was past chairman of the Rubber Division of the

American Chemical Society and was a fellow of the India Rubber Institute of England."

I received the following note from Mrs. James Roe Stevenson. "I am sorry to report that **James Roe Stevenson** has been in the Auburn, N.Y., Hospital and Extended Care Pavilion for seven months. On Sunday he will be 88 years old so will be unable to assist with the reunion. He is very ill, getting weaker both physically and mentally."

I received the following note from **Allen Gould**: "I am sorry to say that I am not going to make the 60th reunion. Have a special meeting of the company coming up on June 15th instead of the 9th as originally planned and I must be on hand even though "semi-retired" for most of the time these days. I notified Jack Babcock with whom I have been corresponding off and on for the past six months, and I have had copies of *Technique* and our *Senior Portfolio* as reference books most of that time and was looking forward to seeing some of the old gang and having a chance to meet some of the wives. We do have some reservations at the Shawmut at Kennebunk Port for late July and August and hope to make contacts with friends from there."

Received the following note from **Walter S. Davis**. "Designing uniquely beautiful buildings which I'm afraid to put my \$'s into. Drinking cafe and lait at our wonderful coffee shop in Palos Verdes talking to fellow loafers who, though graduates of colleges, etc, really are both thick in the head which, when shaken, rattles with the dried-up nothingness that they eventually utter."

The following note is from **Robert P. Waller**: "Now living in retirement houses of the Presbyterian Church." . . . Have heard from **Stuart Chase** and he is still following the field of an author.

The following is a report of our 60th reunion which was prepared by **Jack Babcock**. If it had not been for Jack the

reunion would not have been as successful as it was. Jack was able to do all the work necessary and obtained rooms for members and arranged for the meals for the luncheon and the banquet.

"The 60th reunion of the Class of 1910 was held at McCormick Hall, M.I.T. Campus, on Sunday, June 14, 1970. The total attendance was 34. This included 20 classmates, 11 wives, 1 son, 1 daughter, and 1 other guest as follows: Harold and Jess Akerly, Rochester, N.Y.; Jack Babcock, Portland, Me.; Bob and Marian Burnett, Fall River; Herb and Elizabeth Cleverdon, Wellesley Hills; Alva Court, Annapolis, Md.; Art and Mary Curtis, West Peabody; John Gray, Salem, and his son, Robert; Al and Janet Hague, Pompano Beach, Fla.; Russ Hastings, Brookline; Ralph and Meta Horne, Malden; Carl Lovejoy, Boynton Beach, Fla.; Fred Lufkin, Portland, Maine; George Lunt, Wellesley Hills, and his guest Mrs. Gene Williams; George Magee, Garden City, L.I., N.Y.; Murray and Eva Mellish, Malden; Carl and Irene Sittinger, Peterborough, N.H., and their daughter Barbara; Walt and Romalda Spalding, Honolulu, Hawaii; Jim Tripp, Greensboro, N.C.; Bill and Gertrude Wallour, Wellesley Hills; and Chet and Helen Wilson, West Newton. Although official 1910 activities were scheduled for June 14, a number of classmates arrived earlier (June 11 to 13) and several informal get-togethers took place. Following our class dinner (Sunday p.m.) about half the group went to 'Tech Night at the Pops,' a feature of this year's Alumni Homecoming. On Monday, June 15, about 20 members of our group attended the annual alumni luncheon at which the gifts of the 25-, 40- and 50-year classes were presented to the Institute. The luncheon program concluded with an interesting and most timely address by President Howard Johnson.

"The formal 1910 reunion program started with our class luncheon on Sunday at McCormick Hall. Following lunch Jack Babcock, Class Reunion Chairman, recounted some of the 'highlights' of our 40th to 55th reunions and gave some figures as to our current class membership. In conclusion he had a few words to say (some serious—some humorous) about each of those attending our 60th reunion. On a motion by Jim Tripp, it was voted that the present class officers should continue to serve until further notice. These are: President, George Lunt; Vice President, Ralph Horne; Secretary, Herbert Cleverdon; 'Estate' Secretary, Walter Spalding; and Class Agent and Reunion Chairman, Babcock. Later in the afternoon Russ Hastings, our official class photographer, took a group picture in the '1910' lounge at McCormick Hall. We then went to the nearby Stratton Student Center for our traditional cocktail party (hosted by Ralph and Meta Horne) and an excellent class dinner. There was no speaking program after the dinner as a considerable number of our classmates and their wives went to the Pops that evening.

Our accommodations at McCormick Hall, a fairly new women's dormitory, were excellent. We were given a luxurious lounge there for our class headquarters and assembly room where we exhibited a number of photographs from our class reunions of the previous 20 years. We had copies of the 1910 *Technique*, *Senior Portfolio*, and other 1910 mementos on hand. During our class reunion and the Alumni Homecoming the following day, the weather cooperated perfectly—sunny and fairly cool throughout. We feel sure that all our classmates, their wives, and other guests thoroughly enjoyed the 60th reunion of the Class of 1910, held for the first time on the M.I.T. Campus in Cambridge, Mass."

I called **John Barnard** down at the Cape. He was sorry he could not attend the reunion as his wife is ill and he had to stay home.—**Herbert S. Cleverdon**, Secretary, 112 Shawmut Ave., Boston, Mass. 02118

11

Harold Robinson let me know of an article by General **George Kenney** in the December, 1969, *American Heritage*—excerpts from a diary that George kept during his service in France in World War I. It is typical of him and is fascinating reading. I had not known before that he was shot down, wounded, spent months in hospitals and returned to flying on forged orders before the doctors were ready to release him. George also had an article in the June, 1970, *American Legion Magazine* telling of some prophecies made by his idol, General Billy Mitchell, that later came true.

M. Curtis Kinney, who graduated from Kenyon College in 1910 before coming to M.I.T., was instrumental in getting every able-bodied man in the class to attend that 60th reunion luncheon. Curtis has six grandchildren, three living in London, England and three in Mexico City. He is a member of Players Club, New York, Silver Wings of W.W. I of Arizona, The University Club of Columbus, O., and the Rotary Club of Mt. Vernon, O. He gave up his career in architecture after the first world war and for more than 50 years has visited his family store, J. S. Ringwalt Co., of Mt. Vernon, six days a week.

I had a card mailed in Lake Louise, Canada, from the **Allston Cushings** who were on a bus tour from their home in Kansas City during July. Allston is the national secretary of the American War Dads, Inc., and very much interested in this group. He has been secretary of this association for the past 10 years. After retiring as valuation engineer with the U.S. Department of Agriculture in 1950 Allston spent three and one-half years on the rehabilitation of a large ordnance works near Kansas City. Since then he has lived a quiet and happy life with his wife of 49 years. The Cushings have two sons: Donald, a re-

tired lieutenant colonel in the U.S. Air Force; and Gerald, a heating and ventilating engineer.

By the time these notes reach you, you will have received the first mailing regarding our 60th reunion to be held in McCormick Hall on the campus over the first weekend of next June. McCormick Hall is fitted out as well as any hotel I ever was in with its spacious lobby, attractive dining room and a penthouse with a fine view of the Charles River Basin. If Curtis Kinney could get all the healthy members of his Kenyon College class to attend their 60th luncheon, we of M.I.T. should do as well. I'll be looking for your reply card properly marked and any suggestions that you have.

The following quotation is from the June, 1970, issue of *Railway Locomotives and Cars*: "**Ed Woodward**, who retired as western editor of *Railway Locomotives and Cars* in 1954 has since served as consulting editor on the West Coast. He was honored in April with a 50-year membership pin by the American Society of Mechanical Engineers. Ed started railroading after graduating from M.I.T. in 1911 and joined Simmons-Boardman in 1917. During his active years with us, he was also secretary and chairman of A.S.M.E.'s railroad division. 'Active' may be the wrong word since Ed apparently has never been idle—certainly not in his years of 'retirement.' Ed constantly keeps in touch with Southern Pacific, Western Pacific, Santa Fe, Pacific Fruit Express and other railroads and suppliers in his area. And does a fine job of it too." Ed says he has three avocations: handball, golf and fishing, but only reads about the first two now. He and his wife who acts as his secretary are in good health.

Dr. Paul Cushman sent this note through the Alumni Fund: "I had 13 days in the hospital with three major operations in April, but am now back to work." . . . **Norman Duffett** has a new address: 1309 Second Ave., South Lake Worth, Fla. 33460. . . . A fine long letter from President **Howard Williams** told of a six-week trip he and Katherine took this past spring. They drove 4,000 miles through France, Spain and Portugal.—**Oberlin S. Clark**, Secretary, 50 Leonard Rd., North Weymouth, Mass. 02191

12

DO YOU REMEMBER this story from our English professor Arlo Bates? An old English author wrote daily letters to his mother, until one day he surprised her by beginning, "Dear Mother: Today, I am going to write you a long letter because I have not time to write a short one." The point is well taken, as George Chambers pointed out in the preface of his recent contribution: "As for class news you may write as long a letter as you wish."

At long last we have received a letter from **Clarence Woodward**, Course III,

which reads, "The summer before graduation, I worked nearly a mile underground at the Bunker Hill and Sullivan lead mine, located in Kellam-Wardner in the Idaho panhandle. In 1912, I accepted a field job with the Canadian Geological Survey in the Canadian Rockies under the supervision of the late Professor John A. Allen. We covered a great scenic section, running about 100 miles east and west of Field, British Columbia. After five months here, I worked with the United States Government as a chemist at the Charlestown, Mass., Navy Yard, but found the work too confining. So in 1915, I transferred to the Barrett Mfg. Co., in Everett as assistant superintendent, where I remained for four years. In 1919, I went with the Associated Factory Mutual Fire Insurance Companies, working out of Boston as field engineer and inspector. In this work I travelled most of the time, covering most of the United States and southern Canada, and visiting many of the larger manufacturing plants in these areas. I had many interesting experiences and met several well-known persons. I recall an interview with Thomas A. Edison in his laboratory at East Orange, N.J. I met Steinmetz during a visit to General Electric at Pittsfield, Mass., where I witnessed one of his first experiments with artificial lightning, using one million volts of electricity, with which he was able to send a spectacular discharge some 17 feet through the air.

"At Peoria, Ill., I also met General Leonard Wood when he was running for the presidential nomination. He was a great orator and patriot who was given a raw deal by President Wilson at the start of World War I. I well remember seeing Charles Lindbergh when in New York; he had just returned from Paris. I went down to see the parade at the Battery and he passed by, going up Wall Street amid clouds of ticker tape. While on an assignment to Smooth Rock Falls, Ontario, some 100 miles south of Hudson Bay, I recall that temperatures averaged 42° below zero for a week. Here I witnessed a rare and startling 'curtain aurora' of purple, green and pastel shades, covering the entire northern sky from horizon to horizon and reaching almost to the zenith.

"In 1930 I transferred to the New England Fire Insurance Rating Association in Boston, as a rating engineer, which was also most interesting, and did not involve such extensive travel. I retired in 1963 [and am] living in Melrose, Mass., where I am now busier than ever doing not much of anything. Fortunately, my wife, Ida, and I are in good health. Two years ago, however, I injured my shoulder which forced me to give up golf. I do play a great deal of duplicate bridge, which I enjoy greatly, and think I am a fairly good player."

Wallis Salisbury has sent me another splendid report covering his latest trip, this time three months long, and starting last February. He sailed to Honolulu, the Fiji Islands, and New Zealand, then

by plane, bus and boat to Australia, the Great Barrier Reef, Singapore, Bangkok, Bali, Formosa and Japan, including the World Fair. We are including an account stressing some of his most interesting and varied ventures through rough and wild country, which I could not hope to emulate. Willis has many friends all over the world and you will note that he always finds, and greatly enjoys, the best in epicurean delights. "We arrived in Fiji, greeted by a military band, and boarded a bus which took us to Suva and along the shore to a dock where we embarked on a glass-bottomed boat to view the beautiful coral reefs and multi-colored fish. We had 'tea,' with guitar singing, aboard, and then landed on an island where, after a swim, we were served a wonderful lunch in a grove with trees, bushes and singing birds. We dined at the Fiji Hotel in a lovely garden on the bank of a river. Returning to our ship, the views of the ocean, hills and mountains, were unsurpassed. Debarking at Auckland, we toured the city, and I attended a Kiwanis luncheon with the founder of the club in New Zealand. Next day I met a friend whose father ran the big City Museum. After lunch, he arranged for us to visit an albatross sanctuary, some 29 miles out on a point jutting into the harbor. We saw one albatross sitting on her nest, and climbed down a steep cliff where several hundred sea birds took to the air with loud cries. Many seals slithered into the sea and then rose up to watch us.

"Next day I drove over to Queenstown to see another old friend who has a sheep ranch high on a hill overlooking a beautiful lake surrounded by snow-capped mountains. We drove up one of the mountains to a huge wild animal refuge being developed by his friend, and I took some unusual pictures of goats, mountain sheep and their large red deer as they were being fed. We had venison steak for dinner. Next morning I flew over snow-capped mountains, glaciers and deep gorges to Christchurch where I attended vespers at Christ's College with another old friend. Next day we had tea with the faculty and in the afternoon went to see a girls' swimming contest." Unfortunately, his entire report is just too long to reprint here, but I'll circulate it to any classmate on request.

We have a letter from **Seth Seelye**, Course VI, of Spartanburg, S.C. He left Tech in 1910 and then worked three years in Panama and Guatemala as a civil engineer. Switching from electrical to civil engineering would have required an extra year at M.I.T., so he went to the University of Wisconsin and graduated in civil engineering in 1915. After various construction jobs in Ohio, he served in World War I with the 23rd Engineers in France. After the war he worked as an engineer in Haiti, South Carolina, Santo Domingo, New Jersey and New York. He then transferred his activities entirely to investment work and so continued until retirement in 1952 as a trust investment officer with the City Bank Farmers Trust Company and the National City Bank,

both in New York. Since retirement Seth and his wife have lived in Spartanburg, S.C., which is his wife's home town. Both are, fortunately, in good health and are enjoying life. For hobbies he works in his basement workshop and also cares for a large and beautiful flower garden which we understand is a show place. He is also actively engaged in managing a number of investment accounts as financial consultant. In addition, Seth acts as treasurer of the Animal Shelter and has served as secretary-treasurer of the county nursing home. Mrs. Seelye is active in several community projects, and both are interested workers in the Presbyterian Church. They visit with relatives in Florida several times each year and take other interesting trips about the country. Seth, we are so glad to hear from you. Best wishes!

George L. Uman, Course I, writes from Los Angeles, "Glad to get your letter; I thought I was the 'forgotten man.' In June, 1912, I was informed by Dean Burton that to get my S.B. degree, it would be necessary for me to return for another year and make up failures in English and a couple of other non-engineering subjects. I told him I would prefer to go to work, and he secured a job for me with the U.S. Reclamation Service in Montana, hoping I would change my mind and come back; but I did not, though have often wished I had done so. My career from 1912 to 1946 was in civil engineering, however, including the World War II years with the U.S. Army Engineers, where as a commissioned officer, I worked on airport construction overseas. I retired from the army in 1946 and have since been engaged in several non-engineering ventures which unfortunately have not proved to be very profitable. I am still looking, and my health is better than average at my age of 82. I married in 1914; my wife is also in good health, so we have much to be thankful for. We have three married sons and five grandchildren. We purchased our home in Los Angeles back in 1928 and are most happy here. I have plenty of time and my driver's license has recently been renewed for four years. I greatly appreciate hearing from you."

George Brigham, Course IV, sends us an interesting article regarding his activities. He retired as professor of architecture at University of Michigan in 1959 but for many years had specialized in designing modern types of homes in the community. He made this new form become "respectable in Ann Arbor" which is no small achievement. Only two years ago he became interested in designing inexpensive prefabricated homes for migrant labor in California, a type which may also be used for summer vacation homes. For his many years of creative work in his field we are pleased to report that he was honored with a fellowship in the American Institute of Architects. The presentation was made in Boston last June. Our congratulations and best wishes, George! We are all proud of you.

We are pleased to report that since November, 1967, we have been able to publish some information on all but two of our 88 living graduates. These are **Horace Payson**, Course I, Box 105, Uphams Corner, Mass. 02125, and **Fernando Lavenas**, Course I, Caracas, Venezuela. Several letters have been written to each but without a reply. If any classmate has or can obtain any information regarding either man, a note will be appreciated and make our records complete. We are continuing to solicit news from the 44 non-graduates, usually 1- to 3-year men.

In the last issue we stated that 16 classmates are still actively employed. It so happens that we have recently heard from nine of these men. **Guy Swenson** writes that despite his crippled condition he still goes daily to the office of his granite business in Concord, N.H. with the help of his son, David, with whom he lives. "I am not complaining because at my age, I am most lucky to be able to get about at all. It has been some time, however, since I have seen or heard from any classmate. I hope the younger generation is not wasting time with its protests, and am fearful that when Vietnam is over, it will go back to looking out only for itself. It may be, however, that the war, destruction and loss of life will not be forgotten too quickly. I am 100 per cent for peace, but do not feel that the present type of protests will bring it about."

Ken Barnard acts as a consulting engineer for the Colonial Candle Co., in Barnstable, Mass. He writes, "Nothing new from the old man who keeps healthy, but my son William has not only followed in my footsteps as a chemical engineer, but has exceeded them. Despite the handicap of getting his Ph.D. in chemistry from Princeton instead of Tech, he has recently been appointed vice president in charge of research at Chicopee Mfg. Co., Milltown, N.J., and is now a director of Johnson and Johnson."

Henry Babson reports that he is most active in his work as a consulting engineer, valuator and real estate consultant. He is busy with professional engagements and lecture work. In 1968, he published the first of three books, *Appraisal Principals and Procedures*, and is now completing the second, *Valuation of Investment Property*. He and Ruth continue to summer in their old house in Goshen, Mass., built in 1779, and would welcome a visit from any classmates. They are enjoying greatly their first great-granddaughter, who is now two and one-half years old.

Phil Dalrymple is another active class member who is an executive with Jackson and Moreland, Boston engineers. He says his third grandchild was married in June. . . . **Jesse Hakes** is keeping very busy with his large nursery and tenanted property in Glenwood, Md. He will be glad to see any classmates. Phone 301-489-4441 for road directions.

Joe Desloge is another active member, an executive of the Killark Electric Mfg. Co., of St. Louis. He returned in June from an auto trip through Bavaria, Switzerland and northern Italy, where he renewed several old acquaintances. He writes, "I was much impressed with the material progress being made in Western Germany, the peacefulness that seems to have been maintained in Switzerland, and the number of tourists, largely Americans, who are everywhere. You asked as to my brother Marcel. I regret to report that he has not been too well, being hospitalized for a time, but at the moment is doing better. I will tell him of your solicitousness. Best regards and congratulations to the survivors of the class of 1912."

We must also include **Jerry Hunsaker** as an active member, since he maintains an office at M.I.T. where he goes every day, though he says only to receive mail, get the professional gossip, attend seminars and special events. He writes, "My outside interests are as a member of the committee to award the Magellan Prize (in navigation) of the American Philosophical Society of Philadelphia and as a trustee of the Boston Museum of Science. I attend annual meetings of the National Academy of Sciences and of the National Academy of Engineering in Washington. I have nine grandchildren of whom three are British born and live near London, where their father is an architect. I see my neighbor, **Fritz Shepard**, frequently and find him good company."

Carl Rowley still spends about half-time in his Cleveland office, Rowley, Payer, Huffman and Leithold, Inc., architects and engineers. He and Betty spent the month of July at their summer home on Cape Cod, after which they turned it over to their large family till October as is their usual practice. Carl writes that **Arch Eicher** and Agnes visited them for dinner one evening last summer and that Arch seems to be improving well. Agnes has written a note confirming this and saying that Arch now gets about the yard to do a few chores even though he is still weak. . . . **Carl Webber**, our ninth active classmate, still travels about as an insurance auditor. He says he is in good health and the only news is that he is a two-time great-grandfather.

Hamilton Merrill writes from Bridgeport, Conn., that he has recently been "out of circulation" for several months but has recovered satisfactorily, we hope. He has sent me several anecdotes of his early chemical warfare service in World War I, which will be published later. . . . We were most pleased to have **John Noyes** spend a night with us last July. He had been touring the country from Texas to Washington with his daughter and stopped to see us en route to his summer place in Brooklin, Maine where he has vacationed for the past 40 years. We had a nice chat reviewing old times and discussing the possibility of an informal get-together with as many classmates as possible at Homecoming 1971 in Cam-



Ray Wilson, '12, and classmate Cy Springall, (right), at Cy's home in Andover, Mass.

bridge next June, at which time we could formulate plans for our 60th reunion in 1972.

We have learned belatedly of the passing of **Joshua C. Pratt** on May 10, 1970, in Framingham, Mass., after a long illness. Joshua spent only his freshman year with us as a member of Course II. He was a life-long resident of Framingham, Mass., and for many years owned and operated the J. C. Pratt Motor Co., an automobile agency. He is survived by a daughter, Jean, and a son, Newton, who lives in California, and his wife, Harriet, to whom we have forwarded the sympathy of the Class of 1912.

In July, Helen and I took a trip to Dummerston, Vt., to attend a meeting of the Connecticut River Valley Covered Bridge Society. There were some 60 people present from different parts of the country and we had a chance to renew acquaintances with many old "bridge" friends. Before returning we stopped to visit **Larry Cummings** and Julie at Holderness, N.H., where we had a ride in Larry's speed boat on Squam Lake. We also stopped in to see **Cy Springall** and Marjorie at their lovely home in Andover, Mass., and spent an evening with **Jim Cook** who has an apartment in Marblehead, "the yachting capital of the world."

Homecoming 1970 was celebrated on June 14 and 15 with an excellent program, including Tech night at the Pops concert in Symphony Hall with a capacity attendance. President Howard Johnson addressed the luncheon in Rockwell Cage at which six 1912 men were present, including John Barry, Bill Collins, Fred Busby, Jerry Hunsaker and Wallace Murray. Bill and Fred told me that they, too, are still active in their jobs as highway contractor and instructor, respectively, and their names should be added to the list above. All of us enjoyed the opportunity of chatting together and only wish we had had a larger representation.—**Ray E. Wilson**, Secretary, 304 Park Ave., Swarthmore, Pa. 19081; **Jay H. Pratt**, Assistant Secretary, 927 Fair Oaks Ave., Oak Park, Ill. 60302

Here we are again. This is the start of another milestone, the year of 1970-1971. The M.I.T. Alumni Homecoming days were outstanding as usual, and the Committee members should be praised for their efforts. The Capen family enjoyed both days, June 14 and 15, 1970. We accompanied Ellen and **Ellis Brewster** and also **Charlotte Sage** to the International Buffet. The various tasty entrees were exceptional. We five proceeded to the "Tech Night at the Pops," where we were joined by **Frank Achard**. As always, the Pops program, conducted by Arthur Fiedler, was superb.

The various seminars were greatly instructive and interesting. We enjoyed the hospitality of John Mattill, Brenda Kelley and the staff of the *Technology Review* at the coffee hour. The traditional luncheon was very pleasant and President Johnson's yearly report instructive. 1913 was represented by **Charles Thompson, Charlotte Sage, Burton Cushing, Warren Glancy, Francis Achard, Philip Terry, Walter Muther** and his charming daughter, and Rosalind and **Phil Capen**. The panel, composed of representatives of the faculty, alumni, and students, was exceedingly informative and enlightening, discussing various problems being experienced in the M.I.T. community. The social hour was very successful and brought together many friends and acquaintances of the faculty and members of other classes. The Dutch treat dinner at the Student Center concluded the Homecoming days for 1970.

George Bakeman writes: "Dear Phil: Here we are, once more the glorious fourth has passed us and we are again enjoying to the full, sweet yellow corn, red ripe tomatoes, luscious peaches and sundry other products of the garden lot. In my own case, my garden is way behind, (and how the morning glory does grow after the recent rains), as Mollie and I spent April and May with old friends in France and England, revisiting our haunts of the twenties and thirties, and admiring the ability of both the French and the British to solve urban and communications problems which we are struggling with. America still can learn much from the old world. It is always a pleasure to read your class notes, even though many of them are necessarily sad. Boylston Street and Trinity Court get further and further away and our ranks get thinner and thinner. Please extend my greetings to my friends in both 1912 and 1913. I think of them often with pleasure. We all owe a big debt to our Class Secretaries for their continuing efforts."

We are terribly sad, but we must report the death of **Halsey Elwell's** dear wife, Leona S. Elwell, March 15, 1970. To Halsey, we extend the sympathy of all of the members of the Class of 1913.

A note from **Edward Hurst** has been received and we quote: "Dear Phil, Had very pleasant visits from Ellis and Ellen

Brewster while in the hospital. They were very kind to me. Hope to get back at my work for the blind before too long."

With a very heavy heart we received from George Bakeman a clipping from the *Birmingham* (Ala.) News, and we quote: "**Prescott V. Kelly**, 79, Birmingham business and civic leader, died June 1, 1970 at his home. Mr. Kelly, a native of Haverhill, Mass., was a graduate of the Massachusetts Institute of Technology. He came to Birmingham in 1920 as Southern sales manager of the Blaw-Knox Co., and has lived in Birmingham ever since. Private funeral services will be conducted by Johns-Ridout's Southside Chapel. Mr. Kelly has been a member of the Rotary Club of Birmingham since 1930, serving on its board of directors. He was formerly a member of the Photographic Society of America, his photographs being exhibited in international salons. He was one of the founders of the original Birmingham Civic Symphony. A great book lover, he collected one of the South's finest private libraries, with rare American and English first editions. Survivors include his wife, a daughter, Mrs. Jos. H. Meade, Birmingham; a son, George Kelly, Riverdale, Md. and a number of grandchildren and great-grandchildren." To Marguerite, Prescott's dear wife, and to his family we extend the sympathy of the Class of 1913, and also of the Capens. We shall miss you and your cheerful letters. We have considered Prescott and Marguerite among our closest friends.

Once again, we regret to report the passing of our good friend, **George Dempsey**, and we quote: "George A. Dempsey, 79, retired shoe manufacturer, and former president of the N. E. Shoe and Leather Association, and the Boot and Shoe Club, died June 15, 1970. His home was 51 Stoney Brae Rd., Newton Highlands. He was owner and treasurer of the Farmington Shoe Company of Dover, N.H., a former president of the 210 Associates, and a member of the Clover Club of Boston and the Woodland Golf Club. A requiem Mass was held at St. Patrick's Church, Natick. He leaves his wife, Mrs. Evelyn Dempsey of Newton; a daughter, Mrs. John R. Schott of Frankestown, N.H., and a brother, J. Walter Dempsey, of Medford." To George's family we offer our most sincere sympathy from the members of M.I.T. Class of 1913.

We wish you a very healthy Thanksgiving. **George Philip Capen**, Secretary and Treasurer, 60 Everett St., Canton, Mass.

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We missed the June Homecoming session (Alumni Day to you) which was attended by '14ers **Dinny Chatfield, Frank Atwood, Les Hamilton** and their wives. Ham reports that a good time was had by all—some 500 at the cocktail hour and a very good program in general. Incidentally, he notes that R.O.T.C. is still in the picture in the Boston area schools only at Northeastern and M.I.T.

Louis W. Currier died at his home at 815 Highland Terrace, Pitman, N.J., 08071 on June 23, 1970. Early after graduation he spent time instructing in geology at the University of Idaho, later at Northwestern University, and still later at M.I.T. Louis became a professor at Syracuse University in 1922; in 1926 he moved to the Missouri School of Mines in Rolla; in 1928 he moved to Purdue University. In 1931 he joined the U.S. Geological Survey in Washington, D.C. Our records indicate that Louis was still in Washington in 1961.

Starr W. Stanyan, Course VI, died August 12, 1969, at Center Harbor, N.H., 03226. His first business connection was with the American Can Co. in South Boston. A few years later he became connected with the Goodrich Rubber Co. in Akron, Ohio. Shortly after, he joined the Goodyear Tire and Rubber Co. in Los Angeles. Starr then joined the Ohio Brass Co. in Mansfield, Ohio. He returned to the East about 1933 and lived in Arlington.

John E. May died on July 13, 1969, at his home, RFD 2, Allentown, Pa., 18103. He was Course I and was enrolled with 1914 during his third and fourth years. The records show that John spent most of his professional life as engineer or cost accountant with Landers, Frary and Clark in New Britain, Conn.—**Herman A. Affel**, Secretary, Rome, Maine, RFD 2, Oakland, Maine 04963

15

What a reunion! What a Class—indeed, supreme! The first greetings were Friday noon as we met in our headquarters room at M.I.T., and then under the direction of Wally Pike's transportation committee we took off for Coonamessett, arriving in time for a cool and refreshing trip to their well-stocked bar and delicious dinner. With exceptional Cape weather we thoroughly enjoyed this delightful place with its excellent food and service. Thirty-four classmates and Larry Bailey's son Bob, '43, made this a tremendous party. At the Saturday night banquet Mary Plummer Rice on her way to Paris, London and Frankfurt graced our head table with her charming manner and said a few touching words about 1915 and her place in it. At the dinner Larry Bailey supplied candy "Life Savers" made on a machine he designed some time ago. The Pirate gave out ball point pens that really write. At this age there were no athletic activities, but it was pleasant to see small groups of classmates sitting around and visiting together. Don Webster, '16, dropped by to see us. Returning to Boston Sunday afternoon the harder ones went to the Alumni Association's Sunday night Boston Pops concert. The rest of us went our several ways to rest.

Present at the reunion at Coonamessett were Phil Alger, Larry Bailey and his son Bob, Sam Berke, Bill Brackett, Evers Burtner, Jerry Coldwell, Alton Cook,

Jack Dalton, Ray Delano, Otto Hilbert, Horatio Lamson, Larry Landers, Henry Leeb, Joe Livermore, Azel Mack, Vince Maconi, Hank Marion, Archie Morrison, Harry Murphy, Ben Neal, Charlie Norton, Frank Parsons, Gil Peakes, Wally Pike, The Pirate, Mary Plummer Rice, Sol Schneider, Bill Smith, Bur Swain, Fred Waters, Bob Welles, Pop Wood, Max Woythaler and Louis Young. You will recognize a lot of long-distance men in there, especially Bob Welles from Altadena, Calif., and Bur Swain from Southern Pines, N.C. Wonderful loyalty and interest.

Our June 1915 graduation class numbered 309 including only 3 doctorates; the original total class mailing list of everyone registered at any time with 1915 was 635. Of these, 199 including 7 foreign are living, 342 are deceased and 94 are dropouts. At our Saturday night dinner we all stood for a silent tribute to the memories of those 342 fine old friends and classmates who have passed on. May their souls rest in Eternal Peace. After a long wait the reunion photo was finally mailed, and the names of the men were keyed with the picture in The Pirate's fine Course I printing. Enclosed also were the signatures of the 34 attendees who said they would be at our 60th reunion, ah me!

Monday afternoon our gracious hostess Barbara Thomas, profiting from Al Sampson's previous help and direction, gave us our annual gala Cocktail Party at the M.I.T. Faculty Club. Welcomed guests of the Class at the Faculty Club Cocktail Party were Mary Scully, Tess Hilton, Bill and Jeannette Sheils, Pearl and Albert Wechsler, '21; Jim Hoey and Dick Feingold, '43; Herbie Eisenberg, '52; Gene Eisenberg, '43 and his son Charles, a Brown sophomore; Gerry Rooney; Paul V. Cusick, M.I.T. Comptroller; Jean and Jack Mohr '50 with their daughters Bonnie and Heather; and Peter and Regina Murphy. For the ladies, Mona and Clive Lacy presented corsages which added a pretty and gay touch for everyone. Thank you very much, Mona and Clive. Including wives, families and guests there were 63 present at this, of whom 46 stayed for our annual class dinner at the club; both were record attendances. Then 30 of us went on to Bill Smith's 19th deck apartment at 10 Emerson Place, Boston, where his charming sisters Charlotte and Florence and his guest Ruth finished up the evening with cordials. I'm running out of adjectives so I leave you to judge what a pleasant, enjoyable and outstanding 55th reunion this was, from the opening drink at Coonamessett to the final cognac at Bill Smith's.

Barbara Thomas, our genial cocktail party hostess adds a lot with this nice letter: "Dear Azel and George (My trusted and loyal assistants!), I just had to put in another five-year note to say that it was indeed a great pleasure to work with you—and thanks so much for your deep appreciation of my diligent efforts in perpetrating such an *elegant*

reunion! However, be that as it may, what other group in the whole wide world is so worthy of these efforts? The Class Supreme! Such good wishes to all! Barbara (Queen for a Day!)" Sophisticate that she is, Barbara's only complaint was that the soup at dinner was *cold!* (It was vichyssoise, ha, ha!)

Excerpts from the many nice letters I have received follow, but in all modesty I cannot honestly nor fairly accept the accolades and plaudits of these warm and friendly sentiments. It's rewarding in itself to have such wonderful expressions from you classmates, many many thanks. But I must and I want to share all this with the fellows who helped. They worked hard, willingly and smilingly to make our reunion so enjoyable and successful. "A mighty fortress, a bulwark never failing" is **The Old Pirate** without whose invaluable help I could not have carried on. His cheerful encouragement kept me going when I was ready to give up. **Archie Morrison** was his back-up man and then **Wally Pike** who handled transportation; **Charlie Norton**, **Frank Parsons** and **Louis Young** were the early reception committee at Coonamessett and helped wonderfully in rooming the men. Charlie Norton had the thankless job of being treasurer to collect at the reunion and did an excellent job. **Larry Landers** worked hard in the "cracked ice department" at the Inn.

Phil Alger comments: "Thanks ever so much for the fine reunion we had at the Cape. I will treasure all the memories and the signatures I picked up—and will look forward to our 60th. I fly to England on June 29. I aim to come home on or about July 20. Allowing time for a few days in Schenectady, I expect to be ready to receive visitors at Loon Lake on July 25—and to stay there until about September 15. That's the best I can do now in the way of dates, so plan to come when you can."

Alice Anderson writes: "Now I have the card about the Class Cocktail Party and would like very much to be there but it is a long way to come alone. I must be in Atlantic City at Haddon Hall for the Regional Conference of AAUW. A \$65,000 Fellowship in my name has been completed just this spring by the Pennsylvania Division and the Region. It is an international fellowship which was only started in the spring of 1968, and the first award will be made this year. Am busy now with events and graduations for the various colleges on which boards I serve. Saturday it was Harcum Junior College, then Montgomery County Community College, with dinner before, and next week the Women's Medical College of Pennsylvania—two lunches, etc. The President of Barnard College is to be the speaker at their Commencement and I am to be her official hostess. I really loved my trip to Africa and would like to go again on a freighter. Am anxious to go to Australia and New Zealand sometime. Best to you both."

Lucius Bigelow says: "I really do regret the necessity of informing you that it does not appear to be possible for me to attend our 55th reunion, although I had very much desired to do so. If it should be deemed practicable and desirable, I would be glad to have any suitable portion of this letter read to my assembled classmates at the dinner Saturday night. First of all I want to tell you that I have by no means forgotten The Class Supreme and more especially those who knew me well in the olden days. Neither have I forgotten those years of 1911 to 1915 during which I worked harder than I ever did in my entire life thereafter, and emerged in 1915 with a first class training in my professional field, some tenets of which I have been able to use for my entire life. Nor have I forgotten our fine 50th reunion, which I determined to and did attend, being brought along by my good old friend John N. Dalton, who took care of me in spite of my failing vision, then less than 5 per cent of normal. Unfortunately my old friend is not in a position to attend this year, my vision has decreased considerably since 1965, and these things together with definitely diminishing strength and restricted income make this decision seem necessary. On the other hand, I have firmly resolved never to abandon the ship so long as it remains afloat. Therefore, I have a small office in our new chemistry building and go there periodically for the purpose of assisting, without charge, of course, any students on the elementary organic level who may be in trouble. If none come, and they often do not, I slip over into the laboratory where they cannot so easily get away, and ask individuals, with a smile of course, some pungent questions about what they are then doing. After the confusion has subsided, I then try to explain the matter and point the way. In this manner I feel that I can still be of some small yet perhaps very real service. After all, being of service is the only thing that makes life worthwhile at any age. Finally, I want to wish you all the longest life, the best possible health, and, what I have told so many of my former students, a dash of good luck to see you along the way."

Maurice Brandt sent this note: "Five years ago I had to cancel my plans to be at our 50th reunion due to just having returned from a very exhausting business trip—I knew I was too worn out to make the long trip. Ever since then I've been looking forward to our "55th." I keep in pretty good health and continue to give five to six hours every day to the quite successful business I started in the 1930s. We take occasional trips involving a couple of hundred miles driving per day by auto, but the 1,000 miles each way, even by plane, would be too much. I went to my M.D. about this trip—he said the 1,000 miles each way by plane, making schedules with the tension involved and probably overeating, etc., and the excitement of greeting so many old friends at a college reunion, would be too much for me, that I was

in pretty good health for my age and I must keep it that way by not overdoing it, so ordered me not to make the trip. I was greatly disappointed but will take his advice. I want to thank you for all the wonderful work you have done in planning and organizing this, our 55th reunion. Please say Hello With Best Wishes from me to each member of good old 1915 and give them my regrets for not being able to be there to enjoy their companionship."

This letter from **Earl Brown**: "When this note is due to arrive you will be enjoying the reunion. I hope the weather is nice so as not to interfere with the meeting. I hope every one has a grand time. Perhaps I will be able to make a trip to Boston next year. There has been no change in conditions here."

Orton Camp says: "I had hoped that it would be convenient to go to Boston so as to take in the Alumni Luncheon and possibly one or two other parts of the reunion. It now develops that I cannot make it. I have to be in New Haven on the 13th and then have a meeting Monday morning in Waterbury which I should attend. I am sorry to miss the 55th Reunion as some of us may not be around for the 60th. My best to anybody who inquires about me. Both Mrs. Camp and I are fine. Although I retired from Platt Bros. a couple of years ago, I still have an office and am keeping reasonably busy."

Jack Dalton notified me that Fred W. Goldthwait, '05 had written him that one of the buildings in the old New London restoration by the New London (N.H.) Historical Society had been set aside as a memorial to our **Speed Swift**. This is a fine tribute to Speed which he richly deserves for his broad and generous giving and community interest in New London.

Otto Hilbert writes: "You and your committee deserve many thanks for the work you put into making our 55th such a happy occasion. It was such a pleasure to again meet with so many of our classmates. This reunion will add to the memories we have of our earlier ones. It was also nice to be back in the Boston area. We spent a week in Lynn after Thursday and were surprised at the many changes. Our best to you and Frank and keep well."

Boots Malone dropped us a line: "I am afraid I will not make it for our 55th. My blood pressure has been 'acting up' and I have not been feeling too well. I remember my mother when she was my age saying, 'Old age is terrible'; I am beginning to know what she meant! Give my best to all the fellows—sorry I won't be with you all."

Bill Mellema writes from Los Angeles that his son, Bob, is a major in the air force in Vietnam. We hope he is safe over there. . . . **Herm Morse**, one of our loyal and generous classmates, wrote that he had waited five years for this re-

union but the campus situation at M.I.T. leaves him cold so he is signing off. . . . From the *Vineyard Gazette* published at Martha's Vineyard there's a line about **Charlie Norton**: "The poison ordinarily used for Island rat control is Di-con, used in hospitals as an anti-coagulant and not harmful to household pets if accidentally taken in small quantities. Always fearful that accidental poisoning will occur when householders use rat and mouse killers indiscriminately, Charles G. Norton, chairman of the rat control program, says that for some time he has been thinking of asking the county commissioners if there is any way of regulating the sale of rat and mouse killers in grocery stores. "I don't know if it's legally possible to stop their sale, but novices really shouldn't be using some of these things. People with a rat problem should bear in mind, anyway, that they're paying through taxes for rat control."

Frank Parsons: "What a reunion it was, thanks to the thorough plans of our top Class Secretary. Everything was considered and worked out perfectly. Hope pictures do too. I'm looking forward to the visit of you and your wife, but let me know when as early as you can. I have August 12 and 13 tied up and my kid sister and husband will stop on way to Florida about the same time, so I must straighten visits out, and I want to have visits from each."

Gil Peakes says: "Again I commend you and all the officers of 1915 on the very successful reunion at Coonamessett. I enjoyed the whole time I was there, especially meeting the old-timers. I got prints of the monograms I collected and I'm sending you enough so that all the fellows can each have one, if you should choose to scatter them around. I would like to submit a comment about 1915 reunions. It seems to me that in respect to reunions on Cape Cod, the class has overstayed its purpose by about 5 years. When the activities were swimming, boating, sand-loafing, golf, etc., Cape Cod was a good place to do those things. This year, none of those. The only activities were eating, drinking and talking. We don't need Cape Cod for that. I think a better place for the kind of activities we have now would most likely be a Boston hotel. That would cut out the extra travelling that you and many of the others had to do. After leaving Poppanessett I drove to Woods Hole on the way to Vineyard Haven to meet my wife. Waiting at the boat was Charlie Norton. He wasn't boarding, but meeting his wife to take her to Boston. Best regards to the secretary of the Class Supreme."

Vi Proctor, widow of Dix, '16, appreciated our invitation to the Class Cocktail Party. "Nice of you to think of me. Please give my best to any inquiring of Dix. It's a lonely life, but I'm kept mighty busy trying to keep up with the chores of the homestead and acreage. Trust you had a grand trip this winter and kept well."

In May **Larry Quirk** was at Expo '70 in Tokyo and wrote that he'd be at the reunion but something must have held him up. We would like to have seen him.

Before the reunion **Mary Rice** wrote: "Thank you so much for your very cordial invitation. 'Stag' always meant stag to me, but of course I'd love to be with you all. I'll be at Radcliffe's 1915 55th reunion and then will join you. Just planning to be in the Boston area makes me homesick. I was thrilled that you were honored with the Bronze Beaver, you deserve it so much." After the reunion she wrote, "It was a superb reunion—as only you know how to manage. Many thanks for making me so welcome."

"Do we have to wait 5 years for another one? McCormick Hall at M.I.T. was very gay with '10, '20 and '45 cocktail parties, breakfasts and dinners and everyone friendly. Sam Berke said there are 'several motels in the area which cater to conventions.' Al distressed me, by a letter before I left home, his looks at the cocktail party and his precipitous departure—and a letter, saying last Friday he was having a hospital check-up. I hope he'll write the results. Relax a bit; even tho you are still only 76 you can't keep up that pace all the time. Best wishes to you and Fran and my sincere thanks."

We were all delighted to see **Al Sampson** back with us and he was welcomed and greeted warmly. However, he left the cocktail party suddenly and later wrote me this explanation: "Please explain in the class news my reason for my sudden exit from the class party at the Faculty Club. Hernias, like Time and Tide, wait for no man. Without any warning about six o'clock trouble started, and I had only one decision to make—head for home with all possible speed as a strangulated hernia is fatal and the process very painful. I go to the hospital for an examination on Friday and it may be an operation is due. At my age that process is not too promising as I have already had three of them that have failed. It was a very fine party and I hope all will understand and accept my reasons and my apologies." I went down to see Al and talked with him several times since and I'm glad to report he is all right with no need for surgery.

Bill Spencer sent word from Baltimore: "I am writing to you at this last moment to let you and the class of 1915 know that I shall be thinking of you on the 17th of April in New York but cannot see my way clear to get there personally. On the 22nd of April I have been selected by the Engineering Society of Baltimore to receive their annual award entitled 'Founders Day Award.' I am quite thrilled to receive it. Pass my fondest regards to all of our classmates and others whom I know. I shall be thinking of you all." Later he wrote: "I will be with you all in spirit and my loyalty to '15 will always be strong. Give my best regards to all my classmates and friends."

Enclosing a small check for the Class.
With best regards to you and your wife."

Ray Stringfield wrote: "We just couldn't make it back to Cambridge for the reunion. Sorry! This finds us at Hartsork Inn 200 miles north of San Francisco just loafing in the beautiful redwoods for a few days. Only trouble is that the dining room is so good I'm afraid I won't lose any weight even at only two meals a day. Best regards to all."

Archie and I met **Bur Swain** at the Boston airport that Friday morning and spent a pleasant time with him until we took off for the Cape. It was good to be with Bur. "Just a line to express appreciation and thanks for the very remarkable party you put on at the Cape. It is very nice to see and talk with various classmates about anything and everything that hardly matters. The sleeping quarters tops, food very good, weather not to be surpassed, all under your excellent management. The reunion could not have been more enjoyable. My best wishes to Fran and yourself for a joyful, pleasant, healthful summer. My thanks again and good health to you and Fran."

Ray Walcott: "As of this writing we are definitely resigned to miss the 55th reunion. And the best we can convey to you—and to all who will enjoy the many joys of joining you and 'the gang' at the Cape and at Cambridge—is) May It Be For All "the greatest"! 'Pat' joins me with fond greetings to you. And to all who are fortunate to be with you at the several gala gatherings we, regretfully, will miss no-end!"

We were all glad to see **Bob Welles** come such a long distance and were glad to have this note from him: "Seems like quite a distance from here (Utah) to Cambridge. My daughter and I are traveling with her house-trailer and are camped close beside an arch like the one on this card. This is desert country—less than three inches of rain so far this year." It's great to have all these pleasant letters from widely scattered classmates. You can see the pressure building up for an interim reunion instead of waiting for the possibility of a 60th. So your Reunion Committee and Class Officers will discuss this and maybe we can come up with something agreeable around Boston in two or three years.

I am sorry to report the death of **Jim Tobey's** wife, Lena, who died June 18 in Danbury (Conn.) Hospital where she had been ill for several weeks. We always enjoyed our visits with her and Jim, and we send Jim our sincere sympathy in his sad loss.—**Azel W. Mack**, Class Secretary, 100 Memorial Dr., Cambridge, Mass. 02142

16

Another milestone has come and gone—our 54th reunion, no less—way out on the invigorating sunny shores of Cape



Class of 1916 at their 54th reunion. (Photo by C. F. Cellarius, '16.)

Cod. Again we were at that delightful ocean-front setting at Chatham Bars Inn, Chatham, where good old Cottage G has served as 1916 headquarters for many reunions in the past and expects to do so again for our 55th next June. It was another sparkling occasion featured by our now-typical 50th-reunion red blazers. This time we had the pleasure of celebrating with the youngsters of M.I.T.'s Class of 1935 on their 35th reunion and Northeastern's Class of 1930 on their 40th reunion. And we really had favorable glances plus words of approval from a number of the wives of the younger classes about our bright red blazers.

Those in attendance at our 54th included: Phil Baker, Charlie Cellarius, Dina Coleman, the Theron Curtises, the Harold Dodges, the Paul Duffs, Jim Evans, the John Fairfields, Marie Fisher, the Ralph Fletchers and daughter Ann and son Sam and pal John Fuller, Barney Gordon, the John Gores, the Cy Guethings, Freeman Hatch, Maury Holland, the Emory Kemps, the Charlie Lawrances, the George Mavericks, honorary member Bob O'Brien, the Dave Pattens, the Izzy Richmonds, the Henry Shepards, the Peb Stones, the Hy Ullians and guest Mr. Silber and the Don Websters.

Ruth and Emory Kemp came the greatest distance from Sarasota, Fla; next was Dina Coleman from Lexington, Ky; then Charlie Cellarius from Cincinnati; Gyps and Cy Guething from Birmingham, Mich.; Phil Baker from Grosse Pointe Shores, Mich.; and Ruth and George Maverick from Charlottesville, Va. As for the shortest distance, we had Frieda and Hy Ullian from their summer place right in Chatham, and Freeman Hatch from Eastham on the Cape.

As our good president puts it, this was again one of those most delightful of reunions, with everything pretty much just what one hopes for. The cottage arrangements were most pleasant, the food and service were just the best you can find anywhere. The general atmosphere was again favored by a number of things—the gentle wafts of salt breezes, the woodsy odor of pine needles, the slipperiness underfoot around the tough scrub pines, the cool ocean view of deepest blue, the crisp

morning air, the call of the bobwhites from the rolling slopes of the golf course, and that whole restful composite that seems to be defining what is meant by "well being." Throughout the week-end the weather was close to perfect as we listened to the 90-degree reports of a heat wave in the cities. The 9-hole golf course, under the care of genial golf-pro Bill Cotter, was in fine shape to start off the season. The younger classes did most of the playing this year but report has it that Anne Richmond and Bob O'Brien attracted such comments as "Wish I could do that!" as they represented the essence of '16. Special word came back that Anne had a double-bounce reverse-twist 9th green putt that would have made real news had it been on TV.

At a class meeting, discussion of campus problems resulted in a resolution deploing the recent violent interruption of the normal academic functions at the Institute and strongly urging the Administration of the Institute to use the power of its constituted authority to prevent such action in the future. Preliminary plans for the 55th reunion next year were discussed, honorary member Bob O'Brien was named general chairman of the 55th, and it was generally agreed that the reunion should be held in midweek rather than on a weekend to avoid weekend travel for those who drive.

Once again, the clambake on the shore was one of the best that New England affords—a characteristic of these outdoor events at Chatham Bars Inn. It was totally delicious with oodles of steamed clams, just-perfect lobsters (did Cy Guething have three or four?), corn-on-the-cob that has never tasted so good in June, even hot dogs for any who didn't care for lobsters and clams, and watermelon and doughnuts. And here, as well as at the class banquet on Saturday evening and at all the luncheons, we had the repeated pleasure of fine wines, served with the compliments of our discriminating class president. At the headquarters gathering place in Cottage G, a number of displays were on hand: two bulletin boards full of past year releases, clippings and photos; a Chinese calendar from Taiwan from Virginia and Joel Connolly; the collection of

secretaries' correspondence with classmates over the last six months; home-made Christmas and New Year's cards for 1968 and 1969 by classmates Hanford, Richmond, McDaniel, Drummey and Dodge; a large reprint of Izzy Richmond's pencil rendering, "Boston 1969," used by Grefco, Inc. of Los Angeles in their recent advertising campaign featuring renderings of major American cities by notable architectural delineators; a collection of picture post cards received over the past year from '16ers; and folders of collected pictures and snapshots of past reunions. The class reunion picture was taken outside Cottage G just before the banquet on Saturday.

We acknowledge the aid of John Fairfield in collecting a number of items of interest over the three days of the reunion. Among the things we can't fail to report are: the sartorial splendor of Phil Baker who went many of us one-or-more better with his impeccable outfits in bright colors of green, red, lavender and blue plus a yellow tie that evoked one fair lady's chuckling comment: "You amaze me!"; the insistence of Charlie Cellarius and his camera that you take off that hat and those glasses; Anne and Izzy Richmond arriving by car instead of Izzy's usual flying; Ann Fletcher and Cy Guething off each morning for a swim in the coolish waters of a nice little bay; Paul Duff and his masterful touch in the telling of story after story; Phil Baker's delight and praise of the lobsters at the clambake; the toast to Ralph Fletcher at the class banquet; Dina Coleman's resolution and his reading of it at the banquet; something new at our reunion: Sibyl and Ralph Fletcher's gracious young daughter Ann; demonstrations of snapping off the spiny heads of ribwort plantain weeds by Mesdames Lawrance, Stone, Shepard and Dodge, and the taste-test identifications of winter dandelions and sourgrass by the same foursome; the terpsichoreans Sibyl Fletcher, Izzy Richmond, Dolly and Peb Stone all ready to go on the slightest tinkling of cocktail lounge music; the excellent service in the dining room—waitresses and management—with the aid of Bob O'Brien's two helpful daughters, Kathy and Anne; shopping in town by many, including Gyps Guething, Dolly Stone, Sibyl and Ann Fletcher; Izzy Richmond's reportedly 35-minute morning exercises with portable phonograph; day-early arrivals and departures of the Guethings, Dodges and Phil Baker (you should try it) and then Chatham-area sight-seeing explorations of Cape Cod; use of liquor left over from last year signifying modified consumption and dependable storage; the discovery that Freeman Hatch is the miller of the windmill at Eastham, Cape Cod, and has a commercial picture to prove it; the late afternoon return of the local fishing boats, with swirling flocks of seagulls following close behind for the tossed-off parts as the fish are cleaned; and finally, something new we learned from one of the fishermen at the wharf—"scrod" are just the small fish, not necessarily just cod.

We regret to report the death of **Hovey Freeman** on July 23 in the Roger Williams General Hospital following an illness of several weeks. As late as June 5, he had written that he had been in the hospital again with the result that "I doubt very much I can get to the reunion as the doctors want me to stick around." Hovey was a continuing active member in the councils of our Class, and until Francis Stern took over in 1966 was our Class Treasurer for many, many years. He was widely known as a leader in the U.S. insurance industry, was president for 31 years and later board chairman of Manufacturer's Mutual Fire Insurance Company with its home office in Providence. We are indebted to his son Charles W. Freeman, '40, of Los Angeles for a clipping from the *Phoenix-Times*, from which we quote: "A man of many talents, he was known as a 'builder.' He was basically interested in engineering, but was regarded as one of the keenest men in the insurance field in the country. A 1916 graduate of M.I.T., Mr. Freeman made his mark soon after as an ordnance officer in World War I. One of his exploits was the development of fast production of powder bags for large artillery pieces. At the age of 38 he became president of Manufacturer's Mutual, guiding the large company through the Depression and World War II and developing it into a major factor in the nation's insurance field. He was a director of many corporations and banks, and was a devoted worker for the enlargement and improvement of Roger Williams General Hospital. He served as secretary of the National Fire Protection Assoc., for a number of years. During World War II he was called in by the late Jesse Jones, Secretary of Commerce, to help set war damage insurance rates. His suggestion became the rule. He was noted for his 'do-it-yourself' projects, and his homestead at the tip of Poppersquash Point is a monument to his hobby. Much of his time in recent years was devoted to keeping the waterfront and property in working order for visiting grandchildren. . . . He is survived by his wife, Marjorie (Wellman) Freeman; two sons, Charles W. and Hovey T. Jr.; and four daughters, Mrs. Robert S. Davis, Mrs. Norman D. MacCleod Jr., Mrs. George H. Dixon, and Mrs. Peter H. Newcomb. There are 21 grandchildren and five great-grandchildren. He was a member of Grace Episcopal Church in Providence." Our sympathies go out to Marjorie and the family.

We also regret to report the death of **Harry Lavine** on April 27 and expect to have more information to be included in a later issue of the column. Our sympathies are also expressed to Florence (Mrs. Lavine) and the family.

Rock-Hunting Safari

A 1916 class announcement: Sylvia and **Vert Young** are off on another "safari"! But this safari, No. 6, is different. Writes Vert: "No shooting this time, except with a camera but plenty of 'hunting,' mostly for 'rocks.' No pain to the ani-

mals, excepting ourselves." They sailed on June 5 on the Farrell Lines freighter "African Mercury" for Walvis Bay, Southwest Africa. Their itinerary includes Karibib, Tsumeb, Berg Aukas and Windhoek in Southwest Africa; Prieska, Griquatown, Pretoria, Durban, Cathcart and Capetown in South Africa; then Perth and Sydney in Australia; Christchurch and Auckland in New Zealand; then Fiji Islands, Tahiti, Honolulu and home, picking up and swapping specimens all the way, presumably.

From Durban, July 20, Vert writes:

"We are having a glorious trip, not the least of our fun being reunions with friends of eleven and seven years ago. Also lots of rocks—at practically every stop. Following a couple days at Barberton we came south through Swaziland, a high mountainous area. The climb of 28 miles up to the Havelock asbestos mine was a hair-raiser. Beautiful scenery, they tell me, but I was too busy watching the road, unpaved, no shoulders, no guard rail, 100 to 1,000 feet sheer drop on one side and not 500 feet of straight road in the 28 miles. The asbestos is shipped to Barberton railbed by a 12-mile-long cable which also brings supplies back up to the mill. Tomorrow we head south again through the Transkei to Cathcart where a rockhound correspondent and swapper will meet us and take us to his sheep ranch for a couple nights." And Sylvia is writing her "Safari Letters" with colorful descriptions in her inimitable style. Here is a segment from Pretoria written also in July: "Africa is not asleep. Like the giant it is, it has awakened, with vim and vigor. Such changes have taken place since our last visit seven years ago. Cities have grown over three times their former size. Pretoria is showing the greatest increase in population and activities. But Windhoek and Capetown, too, as well as most of the small villages, such as Keimoes, Griquatown and many others have become busy centers, showing all manner of improvements. Hotels are now graded and this has meant putting in private bathrooms, painting, cleaning, improving food—more lights—better service—but still no heat. We have never been colder! No one ever closes a door or window when night falls! During the day we are wrapped in glorious sunshine, but nights, in unheated hotels—it is a different story! There are fireplaces in the lounges, but the fireplaces are small. Coal is burned in them and if you are lucky enough to arrive in time to secure a chair near them, one part of your anatomy may feel the blessed warmth. But drafts soon chill you through and through! Of course, many of the hotels in large cities like Capetown and Pretoria do have electric heaters in the rooms. Even with these burning all night, we sleep under three and four blankets and down comforts and it takes courage to take a bath! Bathrooms being such luxury, one does muster up enough courage. Then, boy! Look out! The faucet that is marked 'cold' really means hot—scalding. I am covered with blisters and burns, some of them on my arms

where during the night my arm accidentally falls over the side of the bed and onto the heater!" You certainly get the picture, the way Sylvia tells it!

Mail Bag

Paul Page Austin in San Francisco is currently working on a job that sounds real exciting to most of us. We'll have more later but it all has to do with a big copper mining operation in Bougainville Island, the largest of the Solomon archipelago of the Southwest Pacific. It is a joint venture of Bechtel Corporation and the company Paul is with, Arthur A. McKee & Co., and based on the initial finding of rock samples rich in copper ore. . . . In mid-July **Cy Guething** sent word from Boothbay Harbor that he was about to take the second waking-up swim of the day in 60-degree water (we don't have to ask Howard Hands if he remembers the 52- and 54-degree temperatures of the Maine waters), and that he and Gyps were just about concluding a pleasant five weeks in Maine at the Harbor. Cy notes: "Mil and **Charlie Reed** drove down from Wayne and we had a most pleasant day with them including a 3-course lunch at our famous lobster pound in Boothbay Harbor." . . . Also in mid-July, **Rudi Gruber** came back to New York after six weeks in Europe—his stationery as usual carried the designation "Lindau, Bodensee." Says he came back from London by Pan Am Jumbo-Jet 747! . . . Amelie and **Frank Hastie** didn't make the reunion as they had hoped, but a son and family including two grandchildren on Martha's Vineyard brought them up to Cape Cod later. A card from Virginia and Joel in Brewster, Mass., said Frank had lunched with them on August 1 and that Amelie and Frank were to celebrate their Golden Wedding Anniversary on August 3. By telephone we told Frank how easy it would be to get to Mountain Lakes, N.J., from the Garden State Parkway on their return trip to Dowell, Md. . . . The **Merrick Monroes** of Noroton, Conn., wrote in May telling of their son-and-wife's return from a \$5-a-day month of driving in Europe, his son's forthcoming graduation from Jefferson Medical School in Philadelphia and the then-expected internship at a V.A. hospital in Los Angeles. Miriam and Merrick planned to take a grand park tour in the Northwest starting in August. . . . And **Bob Diemer** of Buffalo finds that our correspondence brings back vivid memories of our undergraduate days so long ago. Says: "We all hate to see these birthdays going by so fast, but the only thing we can do is to be philosophical about it and try to keep in shape as long as possible."

And so we come to the end of the column for the time being. As we have said before, write a little but write often to your willing-to-work secretaries—what you're doing, where you've been, a bit of seasoned philosophy.—**Harold F. Dodge**, Secretary, 96 Briarcliff Rd., Mountain Lakes, N.J. 07046; **Leonard Stone**, Assistant Secretary, 34-16 85th St., Jackson Heights, N.Y. 11372

17

This first note is written two days after the June "Homecoming" (we used to call it Alumni Day). I have no hesitancy in stating that every '17er present (see listing) concurs in my opinion that it was a most satisfactory experience. Mindful of the same time last year, the absence of demonstrators, intruders, threats, bull horns and objectionable individuals this year made the campus tranquil. Besides the visual differences our feelings told us that the campus was one that was under control. No one would go so far as to say student troubles were over, for the nationwide atmosphere is too mercurial for that. Great credit is due our Honorary Members Howard Johnson, Jim Killian and Don Severance along with members of the Corporation, many, many of the faculty, administration members, students and alumni for the handling of a difficult situation. They all deserve our confidence and support.

Activities started with the dinner for Jim Flaherty, as engineered by Ray Stevens, on Friday at the Faculty Club. This coincided with the display of sixteen of Jim's watercolors, subjects varying from Ireland to Mallorca to Dedham and the M.I.T. campus. The menu was a reproduction of an illumination which Nelson Chase had made honoring Jim. Besides the illumination, President Lunn presented an engraved silver dish to Jim in recognition of his contributions. Special pleasure was given to the occasion by the presence of our Honorary Member Jay Stratton and Mrs. Stratton. In responding, Jim presented one of his paintings to Kay Stratton, and also presented one to Ray Brooks and to Stan Dunning.

An elaborate buffet Sunday afternoon started the Homecoming. Afterwards a fleet of busses transferred the capacity crowd to Symphony Hall. M.I.T. Pops night was a great success with a good number of '17ers in their cardinal jackets attending with their wives.

The Memorial Service for M.I.T. Alumni has become increasingly attended and was 'standing room only' this year. A nicely prepared booklet listing the service and all departed alumni of the year was at hand. One of these is sent later to any known widow of the alumnus. Twelve of our classmates were listed.

The Monday luncheon had the largest attendance in several years and was a thoroughly satisfactory gathering. Attending one or more of the functions were: the Howard Johnsons, Killians, Strattons, Severances, Conchita Pearson, the Denens, Dunhams, Les Fords, Hunters, Ken Lanes, Earl Lewises, Lunn, Mahrs and the Ray Stevenses. Stags present were Ray Brooks, Ken Bell, Nelson Chase, Dunning, Flaherty, Hill, Keach, Stan Lane and Strout.

Many have learned that one in public service receives little in thanks and appreciation so there has to be satisfaction

in a job well done. That is what **Al Lunn** should feel on his retirement after 12 years as a member of the Cambridge Redevelopment Authority, having served as its chairman and, as of late, as treasurer. On his retirement he was tendered a testimonial dinner and presented with a Revere bowl which was inscribed "for his untiring dedication and skilled contribution to the improvement of Cambridge through 12 years."

From Winter Park, Fla., **Lawrence Clayton** writes that he has been sidelined and hobbled for several years, "having relinquished one by one all involvements beyond my home and family. I do read the 1917 notes with interest. My wife and I get a good part of our excitement from watching our six grandchildren become young adults."

Last fall **Peso Moody** reported that he was living the quiet life in Denver. Actually he spent from October to May in Winter Park, Fla., doing some work for the Florida Gas Transmission Co.

Only by reading the *Review* was it learned that Frank R. Stevens, '46, is Deputy Administrative Director of the Division of Sponsored Research and Director of Fiscal Planning at M.I.T. Frank is the son of Katherine and **Ray Stevens**.

Frank Peacock writes; "Spent the first full year of retirement and have not made up my mind about it. Two months in Florida and one in Spain and Portugal. I am looking forward to reunion this fall."

It was only last February that an "Atomic Pioneer Award" was given to Lieutenant General **Leslie Groves** for his work as head of the Manhattan Project. It is with regret that his death on July 13th is recorded.

Memorial services for **Ken Childs** were held in the First Baptist Church of Needham on June 8 with Arthur and Charlotte Gilmour, Al Lunn and Ray Stevens representing '17. Art and Charlotte had been present at Ken and Gladys' wedding and quite recently at their 50th Anniversary dinner. After the service Ken's brother Charles, of Childs Gallery in Boston, recalled writing a paper on art for one Jim Killian and one Harold Lobdell in the early days of the present *Technology Review*. Ken maintained an active interest in M.I.T. throughout his career. After World War I with the army engineers he studied at the University of London, then returned to Factory Mutual until 1923 when he joined the William Carter Company and became head of its Infants and Childrens Underwear and Foundations Divisions. He was an active supporter of his church and a trustee for many years. His minister's warm remarks at the service included a quotation from a letter from Stan Lane noting their mutual interest in photography and travel. He also stressed Ken's "outstanding characteristic of a keen zest for living."

Ed Tuttle, whose death was recorded in our last notes, retired from the navy as captain in 1946. Thereafter he maintained an active interest in the naval reserve for many years. His hobby interests were many but special in geneology and in his extensive workshop at his home in Dublin, N.H.

Walter C. Gartner died in Syracuse, N.Y., on June 20 after a lingering illness. Those of us who had been fortunate enough to have visited Heinie and Elizabeth at their home and furniture workshop at Wellfleet on Cape Cod learned of his death with very special feelings.

This issue of the *Review* and these notes start another volume and another year of your class notes. Do these notes interest you? They can only be of interest if you will send along word of yourself and/or your classmates. Right now you can help by returning the post card that accompanied Dud Bell's reunion letter. If you have not done so already, will you do it now? Please!—**Stanley C. Dunning**, Secretary, 6 Jason St., Arlington, Mass. 02174

18

With this issue I commence my third year as your Secretary. It has meant some work, but much reward in the renewal of old friendships and the creation of new ones with many of you whom I had never met in our undergraduate days. I wish each one of you could have this job for a year so that you too could have this heart-warming experience.

Through this journal—and the news media—you are aware these years are most critical for all institutions of higher education, and M.I.T. is no exception. Much publicity has been given to the role of the students, administration, and faculty in meeting the problems facing our Alma Mater. I feel the alumni have not participated to their full extent in the decisions that are being made on the campus—due in part to the fact that many of us act as a 'silent majority.' Maybe I can play a role in seeing that your convictions are presented to the proper authorities at today's M.I.T.

Fred Norton is responsible for a new book, *Technology and Application of Fine Ceramics* (448 pages with 336 illustrations). The advance publicity by McGraw-Hill Book Co. describes it as most complete, covering the field from the raw materials (clays and talc) to the finished fine china, porcelains, and so on.

A card from **Tom Brosnahan** in Pago Pago, American Samoa, indicates that there will be interesting news for you soon from our most traveled classmate.

The **Julie Howes** left last August 11 for a month's sojourn in Austria and Germany. We expect a complete report upon their return. . . . The **Al Grossmans** did not make Alumni Day this year due to the fact that they were just returning

from a well-earned rest in Bermuda. The vacation was a wonderful tonic for both of them.

I am sorry to report the passing on of **Harold Collins** as noted in my letter from Bill Collins. Our deepest sympathy to you, Bill. "I am sorry to write you about the passing of my brother Harold, July 7. As reported in the May issue of *Technology Review*, he seemed to have recovered from his hospitalization at the time of the 50th reunion. The relative inactivity required for recovery irked him greatly. The end came as he was walking on 42nd Street in New York City. He is survived by his wife Betty."

The second weekend in June was the occasion for seeing classmates congregated in Cambridge for the 1970 M.I.T. Homecoming. It was good to see all in good health and enjoying life: the **Julie Howes**, the **Tom Brosnahan**, the **Sam Chamberlains**, the **Eli Berman**, the **Herb McNarys**, the **Clarence Fullers**, the **John Kilduffs**, and **Sax Fletcher**.

From **Eli Berman**, I gleaned his interesting personal history. Upon leaving M.I.T., he went to the U.S. Navy Steam Engineering School and for two years he was an ensign. Upon returning to civilian life, Eli became an electrical supply house salesman. In 1922, he started a radio department as a concession in a department store. Soon thereafter, **Berman Radio Company** was founded and became a chain of six stores which Eli finally liquidated in 1953. In the interim, he spent four years (1941-1945) at the M.I.T. Radiation Laboratory. After World War II, he continued his studies evenings at Northeastern University and received his Master of Science degree. He subsequently taught at Wentworth Institute for two years (vacuum tubes and electrical circuits), then became senior engineer for Laboratories for Electronics (3 years); Eli then taught science for five years at the Chamberlayne School. For the past several years, he has been employed as consultant for various electronic organizations in the Boston area and has just completed some work for Sylvania in Needham. Besides Dolly—who shares his enthusiasm for golf and holds up her end in this field—there are two sons, Ralph and George, both M.I.T. graduates. A daughter passed away some years ago. There are nine grandchildren and two step-grandchildren. Eli is alert, and to me, who has seen him quite frequently over 50 years, he is ageless. Keep up the good work, Eli, and stay young.

A most welcome and interesting letter from **Robert Gidley** follows. I am most grateful to him, as I know you all are, for this most newsworthy resume. I hope many of you will do likewise and send it on to me pronto. "The first thing I look for in *Technology Review* each month is news of my 1918 classmates. There are not many of them in Texas, four or five at the most, for I had the occasion to contact all of them by letter in 1968 when our class held its 50th

Anniversary Reunion. The only Texan who was a 1918 graduate in my course at Tech also was with me at the Charlestown Navy Yard where we had been assigned for further training after taking an intensive naval architecture course in our senior years. He was **Palmer Giles**. Later, **Palmer** and I were associated for several years in an architectural firm in San Antonio, Texas, where one of our commissions was the restoration of the roof of the famous Alamo.

"I married a Texas girl and two years later returned to Boston, eventually buying a house in the suburban city of Melrose. Another 1918 classmate, the late **Bill Wills** who became nationally known for his distinctive colonial house architecture, also lived in Melrose.

"Then, after 16 months in the architectural design department of Stone and Webster I went with **J. Williams Beal Sons, Architects**, and remained with them for eight years. Also with Beal was **Herbert Hatch**, a Course IV classmate at Tech. In this changing world it is rather remarkable that the Beal firm still is located in the same building where it officed some 40 years ago when I was with them, and the last time I heard from **Herb Hatch** he was still with the firm. I believe this is something of a record.

"When the big depression of 1929 came along architecture went underground. I returned to Texas and settled in Dallas. Projects costing millions of dollars are common now but that was not the case 37 years ago. So I turned to other fields, served for eight years as the business manager of a Dallas aviation magazine and then went into advertising, a field in which I remained until retirement. But New England was still a favorite area and my wife and our two daughters made several cross-country motor trips ranging from New Hampshire (where my youngest sister and her family always vacationed) to as far north as Canada and on one trip west to Columbus, Ohio, where the late **Earl Richards**, a Tech classmate and good friend lived with his family.

"Ever since the famous battle of the Alamo, Texas had had the reputation of being a state where things happen. Things certainly happened to me. I was held up and robbed by three army deserters one night when I was returning home; I got caught in a "quickie" midnight flood in San Antonio and had to flee from eight feet of water that drove me out of the bungalow where I was living at the time; and I married and had my first child, a daughter, in Texas.

"On a wild turkey hunt on the **Giles'** ranch of about 8,000 acres I let go with both barrels of my shotgun when the usual salvo is one barrel. I remembered that error for several black-and-blue weeks. And in 1960 when my wife and I drove to the **Giles'** ranch to visit **Palmer** I made a mistake and turned off the main highway too soon and got lost. The road was narrow and rough but I expected

that in ranch country. However, as we drove along it kept getting worse and worse and some of the little bridges where we crossed small streams seemed hardly wide enough to accommodate the wheels of the car. I had unpleasant thoughts of what a breakdown would mean in this unfamiliar area, and the distance to the ranchhouse seemed much longer than it should be. But there was no place to turn around so we had to keep on going. Finally we came to a fork with one road going to the right and the other to the left and no signs to direct us. I took the left fork and eventually we came to a hilltop. In the valley below was a ranchhouse but it was not the Giles' home. Even so it was a welcome sight and we made it to a telephone and discovered that we had been traveling a hunters' trail intended only for jeeps—and that I could very well believe. Happily we did not have to return via the road for jeeps. There was a good road to the main highway where we were met by Palmer and escorted to the turn-off to his ranch.

"Travelwise, 1961 was a banner year for us. My wife and I sailed on a freighter cruise of the Caribbean, touching at Marseille, Venice, Trieste and Athens, where we visited the Acropolis, the backbone of my first year in architectural design where Course IV held forth on the top floor of the Rogers Building. We docked at Istanbul and then went on to Cairo, Egypt before returning to New Orleans, our port of departure.

"In 1939 I designed and built the house in Dallas where we now live, and it would fit into a New England landscape and feel right at home. With two married daughters, eight grandchildren, two of whom are now married, and a great-granddaughter, all living in Dallas, we may perhaps be responsible for at least a minor population explosion."

Our deep sympathy goes to **Ben Ballantine**, whose wife passed away after 50 years and eight months of marriage. . . . **Fred Estes** retired in 1967 and reports his whole time is taken up with the care of his invalid wife. . . . **Charlie Dow** reports no news—for most people, that's good news, but for this column I want more. If you don't send it in, I am apt to descend on you and get it. . . . **Marion Cousens** reports she has retired as a medical bacteriologist.—**Max Seltzer**, Secretary, 60 Longwood Ave., Brookline, Mass. 02146

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Franklin S. Adams and **Royden L. Burbank** were listed as having attended Homecoming in June.

Colonel **William H. Bassett, Jr.**, writes: "Plymouth is celebrating the 350th year after the landing of the Pilgrims, but William Bassett the colony's gunsmith and blacksmith did not arrive until 1621; he had one of the largest libraries in the colony."

E. Russell Hubbard, P.O. Box 853, Pinehurst, N.C. 28374, says our last meeting was at the Tech Luncheon Club in New York City. He writes: "After retiring from my consulting business in 1964 my wife, Dorothy, and I retired to the sandhills of Pinehurst, N.C. We keep cultivating our trees and shrubs, such as dogwoods, hollies and magnolias, camellias, gardenias and azaleas. Also, there are 306 beautiful holes of golf within a radius of 5 miles, which are playable 365 days a year. In my spare time I refinish antiques and continue to be supremely happy and contented. Let's hear from some of you and I'll promise to try to sell you on the sandhills, although I am not in real estate."

Ev Doten, 6176 Bluehill, Detroit, Mich., 48224, wrote in July about his travel plans and sent a lot of news about his friend and our classmate Karl Nutter. Ev writes: "Iva and I have had reservations for a round-the-world trip since last winter. But because of all the unrest all over we have just recently decided to cancel. So we'll probably do a little tripping late this fall either in Arizona or Florida." We hope to see Iva and Ev in Delray later this year. Ev also wrote: "Sorry plans for our June reunion fell apart, but another year I think there will be more interest."

Karl Nutter and Ev Doten were at Camp Humphreys in 1918 in Engineers Officer Training and were in the same company. Ev and Karl have kept in touch over the years, and the following news of Karl comes from a letter to Ev written in July and cleared for publication here as news for classmates. Karl still goes to business. He was president and treasurer of Vita Needle Company, manufacturers of hypodermic needles in Needham, Mass., for 25 years and has now become chairman of the board. He spends some time on Mt. Desert Island, Maine, in the summer and also on Cape Cod. During the past 20 years his hobby has been the Civil War. He has collected a library of several hundred volumes about it and has traveled all over to visit the battlefields and forts—practically every one in the South.

Karl says about his company, "The business still sails along. It has spread out into industry from just medical hypodermic needles. You would be amazed at the number of applications of hollow tube devices like hypodermic needles they are developing in industry. We do quite a bit with many of the electronic laboratories. Some parts (made by Vita) were used in a device sending signals from the moon long before the lunar landings."

An avid reader, Karl goes through five to six books a week with emphasis on history and biography. Karl did not get to our 50th reunion because, with an 80 per cent loss of hearing, he figured the reunion would be a rather difficult undertaking. Otherwise his health for 73 is first rate, with legs holding up well enough to permit bowling in the winter

and gardening in the summer. We hope you will come out to our next Class gathering Karl—maybe next June.

Word has been received that several classmates have passed away:

Walter M. Howlett of Little Colfax Farm RD #2, Cambridge, N.Y., 12816, on May 31, 1970; **Roger M. Leland**, 65 Charles River St., Needham, Mass., 02193 on May 5, 1970; and **James A. Howe**, 10418 El Capitan Circle, Sun City, Ariz., 85351, on October 25, 1969.

Your Secretary was in Painesville, Ohio for a few months this summer while Mrs. Smoley was closing her father's home and estate. We then spent several weeks in Canada, several weeks around the New York City area and a month at Chevy Chase, Md., before returning to Florida.—**E. R. Smoley**, Secretary, 50 East Road (11E), Delray Beach, Fla. 33444

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What a happy and thoroughly successful reunion we had! Everything combined to make it memorable—the perfect weather, the comfortable rooms and that delightful and scenic penthouse, the delicious meals and efficient service, especially that marvelous clambake, the reception at President Johnson's lovely home, the Pops, everything running like a well-oiled piece of machinery due to months of careful planning by that conscientious and untiring committee chaired by **Ed Ryer** and ably backed by his cohorts, **Perk Bugbee** and **Al Burke**—and finally by the presence of those wonderfully attractive and vivacious wives.

Your Secretary would dearly love to describe each and every one of them but would soon run out of admiring adjectives. However, the least one can do is record their gracious presence and salute them one and all for their inestimable contribution to our grand Fiftieth: Betty Abbott, Alice Aborn, Theresa Allen, Esther Bradley, Ruth Bradley, Margaret Brown, Amy Bugbee, Mina Bugbee, Emma Burdell, Betty Burke, Pat Burroughs, Marie Byrne, Mary Clark, Marge Crowley, Barbara Dewey, Gladys Doane, Evangeline Dumas, Page Fales, Billie Gee, Lucy Gibson, Lucille Hall, Emily Haskell, Marjorie Hills, Vera Howes, Ruth Hunt, Evelyn Kaplan, Kay Lavedan, Mildred Lawson, Helen Lipp, Marion McCarthy, Ruth Margolis, Mary Massey, Mayhew Merriman, Clotilde Miller, Lydia Moffat, Lillian Morgan, Frances Nalle, Kay Nash, Chi-Shih Pai, Ruth Pope, Selma Rowe, Beth Ryer, Alice Scott, Irene Snow, Frieda Stark, Florence Thomas, Ella Wason, Ruth Wason, Gertrude Wolfson and Texas Young.

This list is, of course, incomplete without mention of our exceedingly popular classmate, Dorothea Brownell Rathbone, without whom the reunion would not have been as joyous.

To round out the roster of attendees, the following good men and true deserve mention: George Anderson, Frank Badger, Harold Bibber, Larry Burnham, Scott Carpenter, George Des Marais, Chris Duffy, Bob Ellis, Dave Fiske, Al Fraser, Al Glassett, Will Hooper, Frank Maconi, Clarke Morse, Ross Nebolsine, Jack Nolen, Bob Patterson, Jack Perkins, Chuck Reed, Stan Reynolds, Scott Wells and Ernie Whitehead. Glimpsed at the commencement exercises were Ben and Reba Groisser, Abe Shlager and Art Winebaum. Apologies for inadvertent omissions.

Bob Aborn writes that the only information lacking from the program of a "superb reunion" was identification by course. He thereupon undertook to supply such a list through the cooperation of Panos Spiliakos of the Alumni Association. It turns out that Bob's pride in the attendance of Course III is justified, for he points out that 50 per cent of the members of the Course, now living, were present and accounted for, namely himself, **Skeetz Brown** and **Jack Perkins**. This inspired your Secretary to do a little more research on Class-Course attendance. Course XV was runner-up with 15 out of 40, or better than 37 per cent, with Course II close behind, followed by Course I and Course X.

Finally, an account of our reunion would not be complete without mention of the eloquent eulogy to our departed classmates presented by **Ed Burdell**. In an equally eloquent address at the commencement luncheon, Ed traced participation of the Class in "one of the most exciting 50 years in human history." This conclusion bears repeating. Said Ed, "This new generation of scientists and engineers from M.I.T. has had the advantage of a broader education and more advanced training than our generation had. Considering the challenge that faces them and the goals to be reached, may we not expect them to maximize the net gain in technology to the betterment of society? May we even be so bold as to charge them with harnessing effectively the forces of science and technology to the pursuit of the ultimate achievement—the Good Life?"

Several classmates have been heard from since the reunion. **Harland "Dolly" Gray** writes from his summer home in the cool and quiet woods of Maine on Clearwater Lake in Farmington, that it was a great disappointment to him and his wife Eleanor not to be able to attend the reunion on account of health, though he now feels much better. Dolly built his place in the woods 15 years ago. His permanent address is 4425 Coco Ridge Circle, Sarasota, Fla.

Irv Wilson, of 538 Lowell St., Lynnfield, Mass., writes that his son, Robert, '45, attended his 25th reunion with his wife and five of his seven children. Robert remarked that his class, too, was located in McCormick Hall so he was able to observe that "the 50th gang had more

pep than the 25th." Irving reports celebration of his 50th wedding anniversary in July.

Karl Bean comments on the number of classmates that have retired to Florida and says, "We would be pleased to welcome any of our classmates at 55 Early Redberry Lane, Yarmouthport on Cape Cod."

Hank Caldwell expresses regret that his wife's hospitalization prevented attendance at reunion but says that she is now getting along unusually well. Hank retired from his long career with Swenson Evaporator Co. some years ago but has done some consulting work for them since. He says, "We like our home here on Sarasota Bay with the Gulf only a block away." His address is 629 Rountree Drive.

Mike Houghton writes that he wishes he could have been with us but now spends most of his time in Golden, Colo. Since retiring from teaching, the Colorado School of Mines has provided him with a laboratory where he does research in geochemistry on asphalts and oil shales. Says Mike, "On the side I play fiddle in an amateur symphony orchestra." His address is 2217 Cheyenne St., Golden, Colo.

Honoraria Wilson Morgan, daughter of **L. D. Wilson** of 983 North Ave., New Rochelle, gives us the welcome news that both L. D. and Mrs. Wilson were thinking of us all at reunion and are coming along nicely.

Fraser Moffat who attended the 50th, his first class reunion since graduation, writes, "Our round trip to the reunion from here in the 'Endless Mountains' of Pennsylvania covered eight states and 1,200 miles. We are here at 18 Lake Ave., Montrose, Pa., until they put up the snow fences. Here I keep busy with horticulture and being president of the local golf and tennis club founded in 1899." In the winter Fraser and Lydia hold forth at 1035 Park Ave., New York City.

Bill Dewey writes from his summer hideout at Ashfield, Mass., near Williamsburg, that he and Barbara have moved to an apartment near Longmeadow, address: 126A Jamestown Drive, Springfield, Mass.

Edward Cousins is in Akron, Ohio, at 1777 Liberty Drive, and **Ralph Spencer** formerly state highway commissioner of Sikeston, Mo., now lives at 103 Winter Drive, Sikeston.

I regret to report the death of several prominent classmates. **Jack Coyle** passed away a few days prior to the reunion. Jack was a faithful and regular visitor at previous reunions and a number of those at the 50th inquired for him. He lived at 195 Pleasant St., Attleboro, Mass., and had been in ill health for some time.

Jack Kellar died suddenly shortly after

reunion. Originally with our Class—and with a host of friends among us—Jack is now listed in alumni records as '22. He was a contractor in Duxbury, Mass., and a salt-water sailor of note.

Late word has been received of the death of Captain **Gordon Nelson**, U.S.N. ret., in September, 1968. He lived at 121 Christopher St., Montclair, N.J.

Through the kindness of E. B. Rowe, '06, and Raymond A. Snow, '21, I received news of the death of **Oscar P. Young** of 271 Mill St., Newtonville, Mass. Oscar had been associated in many capacities with electric bond and share subsidiaries in the power and natural gas fields. He was president of the Lehigh Valley Transit Co. of Allentown, Pa. He was general engineer consultant for the Ebasco Co., power projects in Australia, Iran, Korea, and India and was project manager for the Kerkut-Bagdad natural gas pipeline. He served as superintendent of operations with the Tennessee Public Service Co. and later as general superintendent of the Knoxville Transit Lines. Earlier he was with the Birmingham Electric Co. as manager of the transportation department.—**Harold Bugbee**, Secretary, 21 Everell Rd., Winchester, Mass. 01890 [Your Secretary has sent a letter to the Editor which appears on p. 97 of this issue.—Ed.]

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Greetings and welcome back to the friendly fireside of the Class of '21 for this most memorable Golden Anniversary Year of our alumni history. Far from our thoughts on that June day in 1921, when we received our sheepskins in Walker Memorial, was another day—50 years thereafter—when we would enjoy a renewal of personal bonds not only with those who had spent years at M.I.T. awaiting that occasion but also those who were with us for only a portion of the undergraduate years; those who transferred to '21 from other classes or universities, and those whose degrees were scheduled to be awarded after further and advanced study.

Some of our number will nevermore partake of reunion festivities. But Father Time has been good to us in making it possible for almost 600 of the Class to "Join '21 in 'Seventy-one" for that special once-in-a-lifetime occasion, set aside for unique honors by the Institute, when we will honor each other in the fun and fellowship of reliving old times with course, fraternity and dormitory mates. Plan now so you and your wife will be present on campus in Cambridge from June 3 through 7, 1971, to celebrate our 50th Reunion. Details will be unfolded in these columns and mailed to you if you so request. For other information address Reunion Chairman **George A. Chutter** at the address listed at the end of these notes.

Return card and data sheet

George wrote you last spring, with a

return post card, asking for an indication of probable attendance and whether you wish to receive further announcements. About the same time, your secretarial staff sent a Class of '21 Directory and asked you to return a personal data sheet for M.I.T. and class records. Returns from both mailings have not reflected the usual standards of prompt action, courtesy and helpfulness we have come to expect. If you did return the card and questionnaire, our sincere thanks; if you did not, please aid us by doing so at once. A few moments of your time will be of tremendous service and will constitute your thanks and appreciation for volunteer efforts to provide for your pleasure. Write for extras if you can't locate either of the two items. Please help us now!

Homecoming frolics

Letters and post cards, besides a long recorded tape, tell of the enthusiasm and gaiety of the group of 38 who constituted the '21 contingent at Homecoming '70 last June. Assistant Secretary **Ted Steffian** remarks: "It was good to see so many in a non-reunion year and particularly to note that the ladies have developed such an interest in the M.I.T. associations of their husbands. We missed Ray and Helen and you and Maxine. Several remarked it was so strange not to see you and Ray around as usual. Next year this must not happen!" Maxine and your Secretary sincerely appreciate a personal message signed by all those in attendance. Kay and **Ed Delany** also sent greetings, saying they would spend several weeks in Europe after June 30.

Everyone agreed a good time was afforded by Tech night at the Pops with Arthur Fiedler and expressed the hope that M.I.T. would repeat the feature as part of our 50-year celebration next June. Ted Steffian and George Chutter sent lists of those in attendance, which included Elizabeth and John W. Barriger, 3rd, Helen and Garvin Bawden, George A. Chutter, Kay and Edwin F. Delany, Maida and Edouard N. Dubé, Sarah and Harry A. Goodman, Laura and Robert W. Haskel, Miriam and Edward W. Haywood, Ruth and Irving D. Jakobson, Algot J. Johnson, Laurie and Henry R. Kurth, Emma and Leon A. Lloyd, Leila and Samuel E. Lunden, Elma and John B. Mattson, Kay and Philip A. Nelles, Jr., Herbert W. Reinhard, Steve J. Seampos, Eric Smith, Lovina and Edwin T. Steffian, Anna and William Wald, Pearl and Albert H. Wechsler, and A. Royal Wood.

Reunion chairman reports

Excerpts from George Chutter's letters and tape include: "Marion and I were delighted to have a visit from Helen and **Harry M. Witherow**, 1189 Mohawk Rd., Schenectady, N.Y. 12309, who were vacationing on Cape Cod. Harry retired in 1968 as senior engineer, New York State Architect's Office, Albany, after a previous retirement in 1960 from 39 years of service with General Electric as engineering manager. A letter from Betty and Assistant Secretary **Sumner Hayward**

says they are on Nantucket Island and will leave for a stay at the Appalachian Mountain Club camp on Lake Winnepesaukee.

"**A. Royal Wood**, 15 Charlton Hill, Hamden, Conn. 06518, also paid us a visit. He and Winnie are celebrating the arrival of their second grandchild, Viren P. Malik, born last July 14. Marion and I also had a visit with Leila and **Sam Lunden** who had traveled from Los Angeles to their home on the Cape at South Dennis. **Everett J. Wilson**, P.O. Box L37, Temple, N.H. 03084, writes that he had a tumor removed from his vocal chords.

"All of these classmates are contacting others of '21 in their home areas and I wish everyone in our Class would write to friends, urging them to plan attendance at the 50th Reunion and to send me a post card stating their intentions. Responses to August 1 show 98 men and 80 wives now expect to share in the anniversary party and more replies are coming in. The program is being developed particularly in view of the large number of ladies attending. I have asked **Mich Bawden**, who has been sailing with Buzz Burroughs, '20, this summer, to handle the golf arrangements for the reunion.

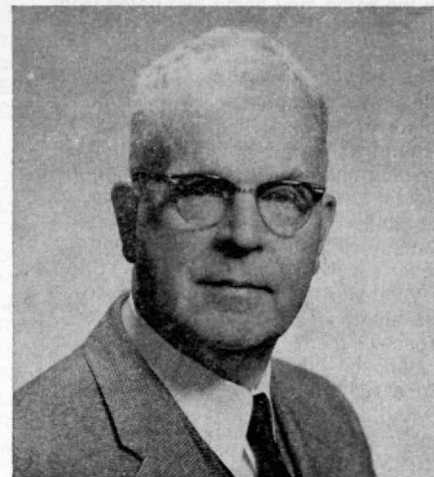
"Madeline and **Ralph M. Shaw, Jr.**, 137 E. Warren St., Beverly, N.J. 08010, paid us a delightful surprise visit. They are planning a trip to Europe including a visit to Oberammergau for the Passion Play. **Paul H. Rutherford** has returned to his home at 7 Valley Rd., Nahant, Mass. 01908, with his bride, the former Gladys Knott. She is a graduate of Pembroke with a degree in economics from Northeastern and a C.P.A. She spent several years at Rhode Island School of Design and had been active in the design field. I have asked Paul to write you details." No word has been received from Paul. **Donald G. Morse**, 44 Lowell Rd., Wellesley Hills, Mass. 02181, has written to your Secretary: "Did you know that Paul Rutherford just married? I took in a party which my sister gave for them in Nahant." Don adds that he still goes to work every day and plays golf whenever he can.

Wed 50 years

An interesting note about an important date comes from Assistant Secretary Ted Steffian: "At Homecoming, Helen and **Garvin Bawden**, 10 St. George St., Duxbury, Mass. 02332, were quite happy over a party some of their friends had just given in observance of the 50th anniversary of their wedding on June 10, 1920. You may remember the excitement caused by an undergraduate being married in those days and the cheers when their daughter, Nancy—the class baby—was born the following June." Congratulations, Helen and Mich, and may there be many more happy years to come!

Belles lettres

Philip M. Johnson, retired colonel, 41



George A. Chutter, '21

Norwood St., Portland, Maine 04103, writes: "Many thanks for your letters and news. Am planning on attending our 50th and will write you at length soon."

In a more somber tone, **John J. McCloskey**, 19 Glen Drive, Whitinsville, Mass. 01588, remarks: "Retired now. Have extensive arthritis." Please return the data sheet, John, so we can learn from what you have retired. . . . **Edward F. Praetz**, 101 Knox St., Lawrence, Mass. 01841, says: "I retired as head of the mathematics department of Lawrence High School at the end of June, 1970. I have held this position since 1938, except for World War II service. In 1942-46, I was mostly overseas in the North African-European campaign as major, Anti-aircraft Artillery and then the Corps of Engineers. In 1960, I was retired from the Army Reserve Corps with the rank of lieutenant colonel. Marcella and I have three married daughters and 13 grandchildren."

A welcome note from the Alumni Office tells of the re-affiliation with the Class of '21 of **John D. Bowman**, 22 Penhurst Park, Buffalo, N.Y. 14222. John will be specially welcomed by members of Course VI. He prepared for the Institute at Andover and was a member of the Electrical Engineering Society and the wrestling team as an undergraduate. When he returns the data sheet, we'll tell you of his professional activities. George Chutter says he talked to John during a recent trip to Buffalo, and the Bowmans are planning to attend our 50th. Glad to have you both aboard! . . . **Eugene A. Hardin** reports a new home address for your '21 Directory: 9 Kensington Terrace, Bronxville, N.Y. 10708. He advises: "I am still in the employ of Parsons, Brinckerhoff, Quade and Douglas, now in the New York office. Since 1952, I have traveled extensively in Europe, South America and the Orient and am now spending about half my time on foreign assignments as sanitary engineering specialist. Gladys and I hope to attend the 50th reunion."

Travel tidbits

Those curious coincidences continue.

In the same mail came two notes from Hawaii. The first, from **Harry P. Field**, Arcadia Apts., 1434 Panahou St., Honolulu, Hawaii 96822, stated: "**Saul M. Silverstein** just phoned. Will see him tomorrow and catch up on news." The second was a newsletter from Saul which remarked, in part: "Telephoned Fields; see them Monday. . . . Visited classmate Harry Field and courageous Catharine. These wonderful friends never received 'Tribute to Rigi.' Shocked beyond words." Saul left in June for a two-month tour of Honolulu, Japan, Moscow, Malta, Europe, England and Iceland on his 28th foreign excursion since 1952. In Tokyo, he noted that his invited article had been accepted for publication in the first "International PHP Magazine" in English, to be published this fall. He gives no inkling of his subject nor the meaning of "PHP," but says the Japanese edition is about the size of *Readers' Digest* and has a 1.5 million monthly circulation, chiefly in the 20-40 age group. On the outskirts of Tokyo, Saul took part in groundbreaking ceremonies for Nippon Mektron Co., a Rogers Corp. affiliate, which were held in a colorful Shinto tent. He comments: "How crude our bulldozer approach really is. Here 100 people were proud to be emotionally and spiritually involved, demonstrating that religion and business are not incompatible." In Malta, Saul was a delegate to the government-sponsored "Pacem in Maribus" (Peace in the Seas) convocation held in the capital city of Valletta (any tie-in to your family, Manuel Sandoval?). Objectives: To save oceans, from 12 miles offshore, with respect to pollution, ecological balance, sharing of wealth and demilitarization; to be held as world's common property under the control of an international agency. His post card from Malta says: "Still an unspoiled area"; and one from Reykjavik, Iceland, comments: "This place is worth special effort; colorful and restful." On behalf of all of us in the Class who were privileged to receive the beautiful "Tribute to Rigi," we express sincere appreciation to Saul.

Directory revisions

To keep your '21 Directory current, please add these recent address changes. . . . **Harry M. Ramsay**, who last wrote that allergies necessitated a move from his previous retirement home in Sun City, Ariz., now advises he has established a new home at 1974 David Drive, Escondido, Calif. 92025. . . . **Louis Mandel** of East Orange, N.J., will spend the winter at Seacoast Towers, 5151 Collins Ave., Miami Beach, Fla. 33140.

Mahlon A. Hartley has substituted a street address for a post office box. Write him at 321 York Ave., Staunton, Va. 24401. . . . **Douglas W. Coe** has changed his home address to 30 Wainwright Ave., Annapolis, Md. 21403. Do you see **H. duPont Baldwin**, Doug?

The long-lost **J. Van Horn Whipple** has been found! He can be reached at 10600 La Reina Ave., Downey, Calif.

90241. . . . **Eugene W. Rudow** has moved his summer retirement home from Bellevue, Wash., to 4207 N.E. 33rd St., Seattle, Wash. 98105. . . . **Herbert W. Gwynn** has retired and moved from Chicago to Marina Manor, 1100 Eighth Ave., South Naples, Fla. 33940

Henry C. Taintor, long a resident of Ormond Beach, Fla., says he now lives at 26752 Carretas Drive, Mission Viejo, Calif. 92675. . . . **Lemuel Pope** has deserted California for a home at 3601 Connecticut Ave., Washington, D.C. 20008, and we hope he will soon return the questionnaire so we can tell of his current activities. . . . **Josiah D. Crosby** retired to Florida some time ago and has moved to a new address there. He now receives mail at 3310 Sheffield Circle, Sarasota, Fla. 33580.

Fall alumni meetings

Scheduled for October 15 is a meeting at M.I.T. of all Class Secretaries, sponsored by the staff of *Technology Review* and the Class Activities Committee of the Alumni Association. It will be followed by the annual Alumni Officers' Conference, October 16-17. It is anticipated that a number of our classmates will take part in both events. A report must await a later issue.

Long distance messages

From Juneau, Alaska, on their way to the Mendenhall Glacier, came a card from Anne and **Wallace T. Adams**, 2606 Fleming Rd., Middletown, Ohio 45042, with the cheery "Greetings from Alaska. On board the Princess Patricia sailing from Vancouver up the Inland Waterway. Beautiful country and good weather with icebergs floating around. We're on a tour out of Chicago by way of Glacier National Park, Banff and Lake Louise."

Ruth and **Irving D. Jakobson**, Northfield Rd., Glen Cove, N.Y. 11542, sent a card with a scene in Belgrade, Yugoslavia, and a note: "We are enjoying a tour of Europe. Have seen the Passion Play at Oberammergau. We are in Sarajevo today and off for the Dalmatian Coast." . . . Kay and **Edwin F. Delany**, 8 Welgate Circle, Wollaston, Mass. 02170, mailed a card from the Schloss Belvedere, Vienna, saying: "Very interesting tour of Europe. Have been in Ireland, England, Germany, Austria and are now on the way to Italy, Switzerland and France." . . . Also visiting Oberammergau for the play are Elisabeth and **Dugald C. Jackson, Jr.**, Tetrastemma, Harmony Hills Rd., R.D. 2, Havre de Grace, Md. 21078, together with their eldest son, Dugald C. Jackson, 3rd, and his wife. Betty and Dug sailed from New York at the beginning of August to tour Germany, Switzerland, Turkey, Greece and Italy before sailing back to New York at the end of September. . . . Helen and **Raymond A. St. Laurent**, 47 Gerard St., Manchester, Conn. 06040, spent most of the summer at Saints' Haven, their comfortable home on Vinalhaven, an island off the Maine coast. We're glad to hear our Class Prexy's report that his checkup by the Boston medicos was

good. Ray says he is walking with the aid of two canes, which affords some increased mobility. During a stop in Center Lovell, Maine, the Saints had visits from Becky and **Elmer W. Campbell**, Theona and **Albert S. Genaske** and Ray's brother, Wilfred, and his wife, Alice. Marge and **Jackson W. Kendall** phoned Ray as they left on a trip for Hawaii, Australia and New Zealand to return in the fall to their home at 401 Hermosa Place, South Pasadena, Calif. 91030. . . . From his home at 5981 La Jolla Mesa Drive, La Jolla, Calif. 92037, Class Agent and Estate Secretary **Edmund G. Farland** sent an enthusiastic message of thanks to all members of the Class for helping establish a new Amity Fund record for the seventh consecutive year in achieving the figure of more than 20,000 donors. Ed says the Class rolled up the eighth largest sum of all the 70 class units reporting and that 52 per cent of our active membership joined in the Class giving—which will be credited to our 50-year gift to M.I.T. Ed phoned us to discuss Class affairs and then called George Chutter to get news of Homecoming '70.

In Memoriam

We record with deep sorrow the passing of three classmates and express to their dear ones the sincere sympathy of the Class of '21.

Willis Leonard MacComb, Box 159, Route 2, Gardiner, Maine 04345, died on January 5, 1970. Mac was born in Chelmsford, Mass., on August 7, 1898. He attended Chelmsford High School and Northeastern College before joining us in the freshman year. He was a member of the Mining Engineering Society at M.I.T. and a private in the S.A.T.C. during World War I. He was graduated with us in Course III and spent almost his entire career as submaster and then principal of Bridge Academy, Dresden Mills, Maine. He retired in June, 1964, and moved to Gardiner where he operated a blueberry farm. He is survived by his wife; a son, Richard W. MacComb; a daughter, Miss Mildred D. MacComb; and two grandchildren.

Palmer Scott, 179 Jordan Rd., South Dartmouth, Mass. 02748, died in Grenada, B.W.I., on February 4, 1970. He was born in Orange, N.J., on December 14, 1897, and prepared for M.I.T. at Noble and Greenough. As an undergraduate, he was the recipient of the varsity "T," a member of the freshman and sophomore relay teams and on the varsity track team for three years. Also a member of Delta Psi and the Naval Architectural Society, he was an apprentice seaman in the S.N.T.C. at M.I.T. Palmer was graduated in Course XIII. He had been president of the Cape Cod American House Corp.; president and general manager of the boat-building firm of Palmer Scott and Co., New Bedford, Mass.; vice president and general manager of O'Day Manufacturing Corp., Fall River, Mass.; and the designer of fiberglass boats, tanks, radomes and church steeples. He served

as lieutenant commander in the naval reserve in World War II. His memberships included the Luncheon, Wamsutta and New Bedford Yacht Clubs. He was a former president of the M.I.T. Club of New Bedford, a member of the New Bedford Port Society and for 20 years a director of the New Bedford Chamber of Commerce. Surviving are his wife, the former Anne E. Belknap of Boston; a son, Duncan; a daughter, Thalia; and six grandchildren.

John Spearman Cummings, 52 Hastings Rd., Belmont, Mass. 02178, died on June 16, 1970. A native of Boston, where he was born on September 21, 1899, John attended Quincy High School and was graduated with us in Course VI. At M.I.T., he was a member of the Electrical Engineering Society and a private in the S.A.T.C. in World War I. He was an instructor on the electrical engineering staff at M.I.T. for a year following graduation. He then served as an engineer with the New York Telephone Co. prior to joining Jackson and Moreland, Boston, in 1937, where he was a project manager specializing in rate cases. He retired in December, 1964. Survivors include his wife, the former Pearl N. Middleton of Watertown, Mass., and a married son, Bruce N. Cummings, Brown, '62 and M.B.A.'69, Amos Tuck School of Dartmouth. We are indebted to Mrs. Cummings and to Ted Steffian for aid for these notes.

Join '21 in 'Seventy-one!

The 50th anniversary of the Class of '21, June 3-7, 1971, requires your attendance with your wife at the most important and outstanding reunion in Class history. Return that card to George Chutter and send back the data sheet to your Secretaries to help us continue to do the job you have come to expect. We need your aid urgently—and now! Happy Thanksgiving!—**Carole A. Clarke**, Secretary, 608 Union Lane, Brielle, N.J. 08730; **Edwin T. Steffian**, Assistant Secretary, Steffian, Steffian and Bradley, Inc., 19 Temple Place, Boston, Mass. 02111; **Sumner Hayward**, Assistant Secretary, 224 Richards Road, Ridgewood, N.J. 07450; **George A. Chutter**, 50th Reunion Chairman, Box 305, Boulder Drive, East Dennis, Mass. 02641

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It is a questionable pleasure to prepare class notes on this 80-degree summery, sunny, mid-August golf day in Buffalo. However, the fact that your Secretary will leave the office at noon for the Cherry Hill Club turns the duty into a joyous occasion. The day is also made more pleasant by a good letter from Katherine and **Dale Spoor**. "Dear Whit: When Katherine and I read such interesting write-ups about all of our classmates taking trips, we sort of got itchy feet, so the first of June we took off for two weeks in Greece. We were fortunate in having perfect weather, and thoroughly enjoyed a four-day bus trip around Peloponnesia, visiting all the

old places which were a few thousand years old—then a seven-day cruise up the Aegean Sea. This included one-day side trips to Crete, Rhodes, Santorini, Ephesus, Mykynos and a day and a half in Istanbul, Turkey. We also had about three days in Athens where some local people entertained us royally and made the trip much more interesting. We understood that one of our 1922ers, **Ted Riegel**, was in Greece about the same time, but we were not able to run into him. After Greece, we had two days in Berlin, with a bus trip to East Berlin and 'Checkpoint Charlie,' then flew to Hanover and rented a car to drive around and visit two of Katherine's nephews who are in the U.S. Army in Germany. We wound up our trip with two days in London, visiting Hampden Court, Windsor and a two-hour boat trip on the Thames. So it was a most pleasant and interesting trip as we had never been to Greece or Berlin before.

"When we are in Richmond, I still have this little job with the Small Business Administration. This is because Katherine said that she promised to 'care for me in sickness and health' but not for lunch. This gives me some place to go in the daytime. My other home activity, outside of keeping up the garden and rosebed is thanking our 1922ers for their contributions to the M.I.T. Annual Alumni Fund. We had hoped to achieve our goal of 50 per cent participation this year from the 'active' 1922 Class, but missed it by one point. However, this 49 per cent was a new all-time high and we'll hit 50 per cent this next year. The most encouraging thing was that we received contributions from about 20 or 25 who haven't given for many, many years, or have been very spasmodic. This was an indication to me that with all of our problems in Cambridge and the fact that many of us are not happy about some of the events, that the 'senior citizens' of 1922 still appreciate what their years at the Institute had meant to them and were interested in seeing that it continues and improves."

Dorothy and your reporter finished our college trip to Iowa State in June, then had a "business" journey to the Broadmoor in Colorado Springs in July and are ending the summer with a short trip to Stratford, Ontario, for a few days at the Shakespearian Festival. Buffalo's weather on Lake Erie has been ideal for both sailing and golf which makes the time spent in working for Ferguson Electric difficult—but we are not complaining!

Parke Appel's report on the June Alumni Homecoming calls it an excellent affair. "The Symphony Hall jammed full for Pops was superb. The Monday discussions were excellent, particularly 'Rapping about M.I.T.' at 2:15 p.m. and a program at 4:30 conducted by our Class of 1922's Professor **Paul E. Gray**. I attended both these and got so interested in what the students brought out about what was taking place among the students at Tech that I had to get up and

shoot my big mouth off in reply. Most of what I said was not original with me but a summary of the talk given by Eric A. Walker, President of Pennsylvania State to the graduating class.

"A list of those attending some of or all of the Alumni Homecoming: Mr. and Mrs. Earl H. Eacker; Mr. and Mrs. Parke D. Appel; Mr. and Mrs. Adrian E. Eckberg; Mr. and Mrs. William I. Horlick; Mr. and Mrs. Theodore T. Miller; Mr. and Mrs. Randy Myer; Mr. and Mrs. Kenneth R. Sutherland; Mr. and Mrs. Oscar H. Horowitz; William B. Elmer; Warren T. Ferguson; William L. Hyland; Julian Lovejoy; Fearing Pratt; Samuel H. Reynolds; Roscoe E. Sherbrooke; Karl Wildes; Marjorie Pierce; C. Yardley Chittick; and Ronald G. Macdonald.

"To torment you I am enclosing comments on the Federal Reserve that I picked up in San Francisco; I expect a full reply from you. Be careful of these invitations to Hollaway Bay that you generously include in your letters. We might pick you up on it." A good report on Parke and Madeline Appel's last trip will come along next month.

Abbott L. Johnson and Dottie, of Muncie, spent June and most of July in Europe but will report later. . . . **Wilfrid** (Tommy) **Thomson** writes that he and his wife were disappointed not to be at the class reunion in June but hope to make it next year. . . . Parke Appel forwarded, with the sympathy of our Class, a report on the death, last May, of **Jack Liecby** in Phoenix, Ariz. Many of us have had deep and abiding affection for Jack and Hardy over the years and will feel this loss. Jack was born in Brookline and attended Milton Academy before going to M.I.T. He spent 17 years with Ebasco Services of New York and in 1946 moved to Phoenix as treasurer of the Arizona Public Service. He was elected to the board of directors in 1955 and retired as financial vice president in 1964. He then became associated with Systems Capital Corp. as vice president and director. Jack was a member of the Phoenix Country Club, the Arizona Club, and a life member of the Pacific Coast Gas Association. He was also a member of numerous "obedience" and breed dog clubs. He had been licensed by the American Kennel Club for 16 years to judge at trials and shows which took him to England, Bermuda, Mexico, New Zealand and Australia as well as over all the United States. He is survived by his wife Lucy Harding; a daughter Mrs. Allen Jennings, of Santa Barbara; a son Derek, of Oakland; and five grandchildren.

Reverend **Theodore S. Wray** has been acting as visiting minister for the Bethany Presbyterian Church of Philadelphia and is acting president of the Lankenau School of Philadelphia. . . . **Paul S. O'Brien** retired in 1965 from Socony-Mobil in Baton Rouge, La. He is now extremely busy in the field of alcoholism having been chairman of the Baton Rouge Council on Alcoholism.

He gave a talk at the international meeting in Prague, Czechoslovakia, in 1966 and is now serving on the governor's alcohol committee of Louisiana's Commission of Law Enforcement.

Frederick W. Wiegand has been ranching and is interested in oil and gas production in Texas and Mexico. His son has been in the Corps of Engineers in Virginia and his son-in-law is a helicopter pilot in Vietnam. His daughter has been working on an educational program for television and is a candidate for a Ph.D.

We received sad news from **M. Thornton Dow** whose wife Elizabeth passed away following a major operation last May in El Paso, Texas. July 7 would have been their 52nd wedding anniversary. Our sincere sympathy goes to our classmate and his family.

Max S. Salomon who was last reported in Johannesburg, South Africa, has sent his greetings hoping that our classmates "are in good health and enjoying their retirement." . . . The *Hamilton Alumni Review* has given a complete report on the award of honorary degrees including the Doctor of Science degree to **Crawford H. Greenewalt**, naturalist and chairman of the finance committee of E. I. du Pont de Nemours. The citation reads as follows: "It is alleged that he practiced clarinet while he kept an eye on the temperature and pressure gauges as a young chemical engineer on the 'graveyard' shift at the duPont Company. But his attention to the clarinet did not keep him from becoming head of the duPont Company. Indeed, this early combination of interests was to be a paradigm for a distinguished career which has brought international renown as industrial leader along with similar recognition for a range of other accomplishments, especially in the field of nature study. He won every woman's heart by engineering the development of nylon from a laboratory discovery to a popular and useful mass-produced fabric. His exhaustive treatise on humming birds, along with its stunning photography, is a collector's item. His meticulous analysis of bird songs and their physical basis has gained widespread recognition and influence, including impact on a study project at Hamilton on the physics of music. For his outstanding accomplishments in many fields, Hamilton College wishes to honor him, borrowing the title of still another of his books, as an Uncommon Man."

We send our sympathy to **Harry L. Pearson** of Minneapolis who has lost his wife after an extended illness. We hope that he will be with us at our 50th, which is only 17 months away.

Congratulations go to **William G. Rapp**, a safety consultant in the erection and fabrication of structural steel for buildings and bridges. We have a copy of his certificate of award given him by the American Society of Mechanical En-

gineers: "In testimony of the high regard of his co-workers and the deep appreciation of the Society for his valued service in the development of standards and conditions sponsored by the Society." This special recognition is for his *Safety Conditions for Cranes, Derricks, Hoists, Jacks and Slings*. He is involved in the new viaduct from Boston's Fitzgerald Expressway through Charlestown to Somerville. He retired from Bethlehem Steel in 1962 but still works three days a week to keep young, healthy and happy.

The sympathy of our Class is extended to the families of **Paul R. Nash**, Los Altos, Calif., and **Herman F. Davies**, Oakland, Calif.

Among the new addresses are: Edward L. Lincoln, E. Walpole, Mass.; Earnshaw Cook, Baltimore, Md.; William E. Huger, Atlanta, Ga.; Herbert D. Allee, St. Petersburg, Fla.; Dr. James L. Guardo, Winthrop, Maine; David R. Shotwell, Limekiln, Pa.; George B. Allen, Lacey, Wash.; Donald B. March, Dennis, Mass.; and Frederick W. Wiegand, San Antonio, Texas.

And now across the Peace Bridge twenty minutes to the golf course to improve a seventeen handicap while trying a new swing. All the while hoping for more good letters from our great Class of '22.—**Whitworth Ferguson**, Secretary, 333 Ellicott St., Buffalo, N.Y. 14203; **Oscar Horovitz**, Assistant Secretary, 45 Gerard St., Boston, Mass. 02119

23

The big news this issue is that **Arthur W. (Dave) Davenport** has taken hold of the production of "The Great History of the Great Class of M.I.T. 1923." He and his wife (a well qualified publications lady) are now hard at work gathering, collating and screening the material they have so far. **James A. Pennypacker** has been appointed research editor. Dave visited us in July and impressed Marge and me with his energy, resourcefulness and sound ideas about how he will go about the job. He will shortly be in touch with all of you, requesting historical data. Please do not be bashful about telling him of your accomplishments. I understand from Pete Pennypacker that most of the info on past reunions is available which is indeed fortunate. Don't forget we have over 700 of us still here and we want to hear from every one of you! He plans to have the history available in time for our Fiftieth in 1973.

I have many reports of general interest for this issue. So I shall go ahead on an alphabetical basis. The first item concerns **John W. Beretta**, who, as reported by Martin Staley '26, received the 1970 Award of the National Society of Professional Engineers at the annual banquet of this organization held in Portland, Oregon. John, who has had a long history of achievement in both

civilian and military affairs too numerous to cover in this column, is now the 20th recipient of this award for distinguished service to the engineering profession. Among previous recipients are such famous people as Herbert Hoover, Charles Kettering, Donald Quarles, and Charles Stark Draper. We have here much material for the Class History.

Now among the "B's," we see that those present at the Homecoming (I am a stubborn character that still thinks of this as Alumni Day), were: Mr. and Mrs. Horatio L. Bond, Mr. and Mrs. John Burchard, Mr. and Mrs. Louis E. Greenblatt, Mr. and Mrs. Thomas E. Rounds, Mr. and Mrs. George Rowen, Mr. and Mrs. P. C. Smith, Mr. and Mrs. Julius Stratton, Mr. and Mrs. A. M. Valentine, and Dorothy W. Weeks. We succeeded in missing all except Bond, Greenblatt and wives, and Dorothy. Where were you?

Now we hear from **Malcolm L. Carey**—"Best regards to my classmates. No really 'hot' news. Am spending a lot of time at our cottage on Lake Champlain which I am building 'by hand' to while away the time. We are all well." . . . **John P. Crabb** tells us: "With return of son John from Vietnam, retirement again with a peace of mind basis." . . . We have another honor to divulge and this is concerning **Earle A. Griswold** who in June of this year received a doctoral degree from the American International College of Springfield, Mass. Earle is a trustee emeritus of A.I.C. and is a retired vice president of Tampax, Inc.

We now see from "News from the National Research Council" that **Robert L. Hershey** was a member of the "Ad Hoc Panel on Control of Sulfur Oxide from Stationary Combustion Sources" sponsored by the N.R.C. We gather from the article that the best we can hope for in the control of SO₂ in the next few years is to hold our own against any increase in the present levels. Frankly, we too are frightened by the way things are going in our technological era. More power to you, Bob; we engineers created this mess—now we must find our way out of it.

Kenneth C. Kingsley writes **Herb Hayden**: "It was nice to hear from you. I have sent my contribution to the Alumni Fund. It was late as we took the Lurline cruise around South America this year, so we were out of town when the notice arrived. Kindest regards."

When in the vicinity of Portsmouth recently I talked with **Forrest Lange** asking him about the Class Constitution. This resulted in a lengthy letter from Forrest telling about his visit to his niece in New York State. Niece Virginia Grammer had two years at M.I.T. in electrical engineering and has just received her B.S. degree from the University of Rochester. Her husband Reynold A. Grammer got his B.S. and M.S. in electrical engineering at M.I.T. in 1947, and in turn their daughter has just graduated

from high school. Anyway, it turns out that we do have a "Graduate Constitution," adopted in 1949, when we decided to elect class officers for five-year periods. Since the class does not own a Xerox and the constitution runs to seven pages, including the documentation, if anyone wants a set please kick in to me 82¢ to cover cost of repro and mailing.

Pete Pennypacker, in commenting on the appointment of **Dave Skinner** to the board of the Charles Stark Draper Laboratory, most favorably of course, said: "This indeed is a mark of distinction for our former class president and genial class member." . . . **Percival S. Rice** (in writing to Herb Hayden regarding the Alumni Fund): "I went to a Don Kent lecture in Brewster (Cape Cod) early in April and ran into Hugh Ferguson, whom I hadn't seen since freshman year. Then at an M.I.T. luncheon, mainly for Drive workers, I saw **Ben Lane**; I hadn't seen him for about the same length of time. **Ed Heap** is retired down here, but I haven't been able to reach him yet. There are others from the '23 class, but none that I recognize. Oh yes, I forgot **Horatio Bond**; I ran into him one night months ago. . . . There is some hope that we may be able to start an M.I.T. Club here. There are upwards of 180 here if my memory is correct. . . . Yale has a smaller group but has monthly luncheons at which 15 or 20 show up."

Again another loyal contributor to the Alumni Fund, **Dunbar L. Shanklin** writes: "I retired at age 56 from W. R. Grace and Co. My son Garrett likewise an M.I.T. graduate chemical engineer (also an M.I.T. mechanical engineer) and I are running two family corporations. One produces the chemicals of my inventions, the other manufactures the automatic packaging machines that Garrett has invented. We are trying to stay small and so far have only 28 employees. . . . We now see from the publication *Mitre Matters* that **Robert C. Sprague**, chairman of the board of trustees (Mitre Corporation, Bedford, Mass.) initiated a MITRE/Bedford seminar series on June 24 with a talk outlining the duties, responsibilities, and make-up of the board and his views on the corporation's future. . . . From **Roscoe H. Smith**, a letter and a clipping from the *Portland Press Herald* of June 15, 1970, in which we see a picture of and comments from **Ben Drisko**. Apparently Ralph Nader has been on the warpath in Maine relative to pollution of streams by the paper industry. "Doc" Smith asks, "could this be our good friend and classmate Ben Drisko?" It just must be as the Camden, Maine address checks, although the picture on the newspaper when compared with that in *Technique 1924* does show some slight changes. Doc goes on to say: "Our place here, in spite of the Ocean Park (Maine) address is on the beach at Bay View in Saco. For a change from the delightful, invigorating water in our surf, Eleanor and I are taking a three weeks', 'quickie' (trip) to

Switzerland and Austria on the first of September, then coming back here before returning to our home in Cleveland." Great planning Doc, you have the best of two worlds for a summer vacation. Switzerland and Austria are my two favorite European places.

Julius A. Stratton is again famous for two more things. He, along with Dave Skinner and Robert Sprague serve on the board of the newly created Charles Stark Draper Laboratory Division of the Institute. Julius has also been active in capital fund raising of some \$5 million for the Pine Manor Junior College. . . . The *Indianapolis News* tells us that **Frank J. Travers**, former trustee of Marian College, was to receive an honorary degree. Frank recently retired as financial vice president of American United Life Insurance Co. Frank writes, in considerable detail concerning his career, that this column does have readership! This is fine news—I was wondering. Anyway, Frank tells us that he did receive an honorary degree of "Doctor of Business Administration." Frank has told us much more about himself but we think that this belongs in our forthcoming class history, so I will send it on to Dave Davenport. Frank goes on to tell us about the "M.I.T. Alumni of Southwest Florida Picnic" held at Englewood, Fla., on April 19. There were some 50 to 75 people along the waterway and the president of this group is **Ray Holden**. **Lowell Holmes** is secretary and **David Joy** was among those present. "It was a great occasion," according to Frank. . . . **Ida B. Webster** tells us: "Practicing architect; designing homes for the aging; member of firm, Weiss, Edelbaum, Webster (New York); married to Morton S. Webster, bond broker; son is professor of modern European history at Berkeley." Much more material, good for class history. Thanks very much, Ida Webster!

We are extremely sorry to hear of the deaths of **Arthur L. Carvill** of Rochester, N.H. on March 29, 1970 and **Kenneth G. Crompton** of Lawrence, Mass. on July 31, 1969.

The following address changes have developed recently: John P. Crabb, 2800 E. Northern Pkwy., Baltimore, Md. 21214; John V. Cook, 22209 N. 29th Ave., Phoenix, Ariz., 85027; E. Fletcher Ingalls, 31 Dolphin Rd., Mumford Cove, Groton, Conn., 06340; Harvey M. King, 227 Bayou Woods Dr., Ft. Walton Beach, Fla., 32548; Hyman F. Marshall, 10300 W. Bay Harbor Dr., Bay Harbor, Fla., 33154; Louis A. Metz, Drawer 55D, Delray Beach, Fla., 33444; Miss Elizabeth C. Nickerson, Wellesley Manor Nursing Home, 878 Worcester St., Wellesley, Mass., 02181; Hugh D. Nickle, Apt. 425, 120 W. Highland Dr., Seattle, Wash., 98119; John C. O'Flaherty, 3715 S. Gilpin, Englewood, Colo., 80110; Robert H. Park, Main St., Brewster, Mass., 02631; Dr. Ernest W. Thiele, 1625 Hinman Ave., Evanston, Ill. 60201; Capt. Floyd A. Tusler, 8308 Wickham Rd., Springfield, Va., 22152; Rear Admiral Richard M.

Watt, Jr., 30 Overlook Dr., Syosset, N.Y., 11791.—**Thomas E. Rounds**, Secretary-Treasurer, 4 Deer Hill Dr., Danbury, Conn., 06810

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Are you a Halley Two? Not yet, certainly, but maybe you will be if the idea of engineer-turned-psychologist **Rutilio Torres G. Saravia** bears fruit. Ru has come up with an intriguing idea. Maybe it won't sweep the country—but then again, who can tell?

You remember Halley's comet. It was in 1910, and surely no boy our age could possibly have missed one of the wonders of the age. It is still clear to me, a great golden ball (probably grown larger with the years), with a brilliant tail of stardust streaking out behind. It was coming straight down at the end of our street, headed directly for a house that stood at its end. I never understood how that house escaped destruction. Away down in Mexico young Ru Torres saw that same phenomenon. Let him tell what it now brings to mind.

"Here is something to think about. We are fortunate to have passed 67 years of age (considered to be 50/50 life expectancy); it is certainly a privilege granted by the Almighty; why not, then, feel optimistic for the future, thinking positively for a long way to go yet?

"In our class, I think, most of us saw and remember Halley's Comet in 1910. Do you remember what a magnificent and spectacular sky phenomenon it was? I was nine years old at the time, and have a distinct and pleasant remembrance of the event. Now then, why not hope to see it again in 1985? This purpose will be positive thinking, and with enthusiasm I believe we will make it.

"Consequently (and here is the idea), let us organize a club, which we may name 'Comet Halley Club' (or 'Halley Two' or what do you suggest), an informal club which may be in our minds specially—no credentials of membership, no fees, no obligations, but a real friendship among us to get our goal—see the comet again."

There may be some question about that date. It is not scheduled to show up until 1986, but what's a year or two to a comet that's been making the same trip since 240 BC, long before England's Astronomer Royal observed it carefully in 1682 and subsequently had it named for him. So you can lay bets that it will be back. And by the way, if any of you feel in the mood to go marching around in parades carrying banners, you can probably dream up something pretty spectacular around that symbol. And so to more down-to-earth affairs.

The **Bill MacCallums'** Mediterranean cruise was fun, Bill says, but also a lot of work. They landed at a great number

of ports, then rushed madly off sight-seeing at each. There was something a bit wistful in listing their itinerary: "Rhodes, Athens, Sicily, Naples, etc. . . . and then Cape Cod with Sandy and Ben at Cotuit!" You could almost hear the sigh of relief. As the MacCallums returned, the **Max Ilfelds** were just about to take off on a 12-passenger freighter, the "Buffalo," from San Francisco to Rotterdam. Then, since they'll be on the continent anyhow, they will spend the fall in Ireland, Scotland, and England. A most pleasing prospect. Last June Max had his 70th birthday, and his family gathered together to do him honor at Pendereis, a spot high in the mountains of northern New Mexico. Sounds like a real gala affair. He commented on these class recordings and the "number of our classmates who have reached plateaus of distinction. Should any of them ever come to Albuquerque we will be pleased to welcome them." It is certain that Max didn't mean that only those who had "reached plateaus of distinction" were included in the invitation, but no matter what your peak, plateau, or valley, be forewarned. Considering the wandering that pair does it would be well to make inquiries at least six months in advance.

Joseph T. Lusignan was one of those who came to us from the Naval Academy during the navy cutbacks of the early twenties. It was the navy's loss and our gain. He got an S.B. and S.M. in electrical engineering at M.I.T., then picked up a Ph.D. at Stanford. Starting as a sales engineer with Ohio Brass in 1930, he was made senior vice president in 1968, and on July of this year, retired. It may not be as important as some of his other titles, but Red picked up a very impressive one along the way, vice president of the U.S. delegation to the Conference Internationale des Grands Reseaux Electriques (CIGRE). Too bad they couldn't have dreamed up a name whose acronym would have spelled "TIGRE." . . . Another retiree, **Robert L. Morton, Jr.**, expected to move to Pensacola, Fla., this fall. As far as we know he made it. . . . **Clarence M. Chaffee, Jr.**, now 71, has no such plans. "Still going strong with Atlas Machine & Ironworks, Inc., of Arlington, Va., (purchasing officer and metallurgist), supplying fabricated steel for bridges, etc. My motto: 'Face Life With A Song, To Get Along.' " Maybe Clarence could whip up a Halley Two theme song.

Luang Videt Yontrakich had a tough year in 1969, physically because of illness and operations, financially because of the terrific attendant costs. "In Thailand, an air-conditioned room in the best hospital costs \$7 a day!" Son Pote was admitted to Yale, and here Videt makes one of the understatements of the year: "As a pensioner, I have found that to support two children in colleges nowadays is a heavy burden indeed." And of course Thai pensions are hardly up to our standards.

The **Clinton B. Conways** came north in

June for Clint's 50th high school reunion in Lynn, Mass. "We took advantage of the date to stay over for M.I.T. night at the Pops on Sunday. We had a fine location with the Ambachs and Schoolers in the third row. However, like Paul I had a bad taste from the events of last year, and we did not stay for the Monday events." Don't know what sort of treats the Conways break out for their winter guests, but this letter was written on July 20, and Clint closed with: "Will be busy now getting ready for the winter visitors." Must be something pretty sumptuous to require that much lead time.

Clint also had the sorry task of sending along the news of **Theron P. Bailey's** death on July 18. Since retiring from the U.S. Corps of Engineers in 1963, the Baileys had divided their time between Clearwater in the winter and Hampstead, N.H., in the summer. Many of you will remember that they were with us at reunion. Theron was not well last winter, and before leaving Florida this spring he underwent lung surgery. It was at their summer home that he died.

Unfortunately this is not the only death to report. After a long siege in the hospital, **Avery Ashdown** died on July 15, ending a long and distinguished career at M.I.T. You will find a detailed reporting elsewhere in this issue. There are several more, some occurring as long as three years ago. In Los Angeles, **Paul Kusnitz**, June 11, 1967; in Clearwater Beach, Fla., **Edward R. Barnard**, December 21, 1967; in Grafton, Mass., **Benjamin J. Bean**, July 17, 1969; in Kennett Square, Pa., **William K. Schweitzer**, September 12, 1969; in Peabody, Mass., **Richard H. Pembroke**, March 15, 1970; and in Newton, Mass., **Howard W. Lewis**, May 27, 1970. To the families of all, the sincere sympathies of the entire Class.

We have a few more items of news that will lose nothing by being held over for the next issue, a time when news is notoriously scarce, so we shall do just that—hold them over. Until then—**Henry B. Kane**, Secretary, Box 177, Lincoln Center, Mass. 01773

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These notes are devoted entirely to a report on the 45th reunion and have been prepared by your Secretary of the past twenty years who now places that job in the capable hands of **E. Willard (Will) Gardiner**. I will try to serve you well as Class President over the next five years, although you know **Sam Spiker** is a hard man to succeed.

All who attended the reunion considered it a success. Every ingredient necessary for a good time combined for the week-end beginning on June 12. The location of the Bald Peak Colony Club overlooking Lake Winnepesaukee in New Hampshire is most beautiful. The facilities of the Club are excellent. The weather was

crystal-clear and comfortably cool throughout the week-end but most important of all, the group present, classmates and wives, was just wonderful. Our only regret was that many of you who had planned to attend did not make it.

So that the record may be complete, the names of those who attended all or part of the reunion are listed as follows: Present with wives were: Edward Booth, Harrison Browning, Gates Burrows, John Campbell, Alan Crowell, Garvin Drew, Cornelius Enright, Leroy Foster, Franklin Fricker, Willard Gardiner, Albert Goleman, Payson Hammond, Edward Harris, William Herbert, Eugene Hermann, Wade Johnson, Masaru Kametani, Daniel Keck, Yu H. Ku, Edwin Kussmaul, Stanley Lane, Finley Laverty, William Mahoney, Joseph McCarthy, Edward Murphy, Arthur Odegard, Rufus Palmer, Wilder Perkins, Edward Piepho, Richard Price, Walter Rhodes, Walter Siddall, Samuel Spiker, William Steinwedell, Donald Taber, Richard Tryon, Francis Turnbull, George Washington, William Wheeler, and Courtenay Worthington. Also present were William Blair, Myron Doucette, Arthur Hall, James Howard, Kenneth Lucas, Edward McLaughlin, Francis Mulcahy, Harold Robichau, Milton Salzman, and Hollis Ware. I hope no names have been omitted, but if any one has been missed, please let Will Gardiner know so that corrections can be made.

Notes, telegrams and telephone calls from several classmates indicated their interests and regrets at being unable to attend. We heard from Robert Anderson in San Antonio, Texas; Bob Read in Sackville, New Brunswick; Tom Killian in Portland, Oregon; Gil Delugach in Memphis, Tennessee. Gil had planned to attend but could not make it due to illness. Also, messages were received from Gil Tarleton in Pittsfield, Mass., and Ed Milne, Shelburne Falls, Mass. Bill Asbury who had expected to be with us was hospitalized just before reunion time; we hope he is now fully recovered.

Classmates began arriving on Thursday afternoon, June 11, and by dinner time on Friday nearly everyone was present. Some of the ladies played bridge during the afternoon and there were some golfers on the beautiful 18-hole course at the club.

President Sam Spiker called for a short business meeting following dinner at which time officers were elected for the next five years. Officers were elected as follows: President, F. Leroy Foster; Executive Vice President and 50th Reunion Gift Chairman, Garvin A. Drew; Vice Presidents: for New England, Edwin E. Kussmaul; Middle Atlantic, Willard C. Asbury; Southeast, Daniel H. Keck; Midwest, William Steinwedell; Southwest, Joseph E. Russell; West Coast, Gates W. Burrows; Secretary-Treasurer and Historian, E. Willard Gardiner; 50th Reunion Chairman, James H. Howard; 50th Reunion Deputy Chairman, Edwin E. Kussmaul; Class Agent, Samuel R.

Spiker; and Class Estate Secretary, Harrison Browning. The meeting was then turned over to "Chink" Drew who entertained all with his "100 years of popular music" with an assist from Ed Murphy.

Saturday was devoted to sight-seeing, golf, bridge and just visiting. A putting contest in the afternoon proved interesting to many. We were privileged to have as our guests the executive vice president of the Alumni Association, Donald P. Severance, and his charming wife, Phyllis.

Following cocktails and dinner, Don Severance talked to us, his subject "M.I.T. Today." Don did an excellent job outlining the manner in which M.I.T. has handled its numerous problems during the past two years. Also, he fielded well some rather difficult and pointed questions. Prizes and gifts provided by Alan Crowell, Rusty Blair, Chink Drew, Mrs. Enright, Sam Spiker and Don Taber were awarded; and a movie, "The World of Fashion," was presented. This movie and one showing automobile racing at Indianapolis presented earlier in the day were provided through the courtesy of classmate Don Henderson and Twentieth Century Fox Film Corporation.

A special award was made to Kamy Kametani for coming the greatest distance. He had no competition, having travelled from Tokyo with his wife who was visiting the U.S. for the first time. They added much to the reunion, and Mrs. Kamy provided an extra something by appearing in colorful Japanese attire. Through the assistance of Kamy we were able to provide each lady present with a Japanese parasol as a souvenir of the reunion.

In signing off as your Secretary I want to thank all of you who have helped me to keep 1925 in the class notes over these many years. To all of you who see these notes, please resolve to keep Will Gardiner fully informed as to your future activities.—**F. Leroy Foster**, President, Room 4-144, M.I.T., Cambridge, Mass. 02139; **E. Willard Gardiner**, Secretary, 53 Foster St., Cambridge, Mass.

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Preparing class notes in mid-August presents problems to a sailor who writes notes on weekends. Last weekend we hauled the boat out on Friday and trailed it to Buzzards Bay to race in the Nationals (a defective fitting by a "quality" maker carried away at the start of the second race so we finished 15th out of 25 boats). This coming weekend we have 57 Star boats arriving on trailers for the North American Championships at Rockport. One Michigan and one Californian boat were here at mid-week but others are coming from Hawaii, Nassau, and from the Gulf to the Great Lakes. With all this week-end activity we must squeeze the notes in before they arrive.

Fortunately we have been hearing from classmates this summer and can incorporate their messages. The first is from Riverside, Calif. "Dear George: Will our Class have some sort of a 45th reunion 1971? If so do you know about when? The reason I ask that is because our son, Dr. John P. Delvaille, has just accepted a supervisory research staff position at M.I.T. (His field is cosmic rays). We could thus combine a visit to his new home with a class reunion, if any. I never thought there would be two generations of Delvailles at M.I.T. Sincerely, **Gilbert (Caro-) Delvaille.**" We replied to Gilbert giving him the name of Chatham Bars Inn, our 45th reunion location.

We have talked about retirement a great deal in recent months. Forced retirement at 65 poses many problems of adjustment which most of us are reluctant to admit. But what about the fellow who runs his own business with no one in the family to take over? He can be stuck for years and look with envy at those who are retired without choice. One classmate about whom I have been concerned is **Agro Landau** of St. Louis but he has finally solved his problem nicely as stated in his recent letter. "Dear George: Apparently a great many of our Class are retiring and finally I joined the group. After a great deal of worry and soul searching, I finally sold my business in June and am retained by the new owners on a consultant's basis with a contract that runs for a number of years. I had a nice visit with **Bill Forrester** at his home in Maui last winter while I was in Honolulu. He seems to enjoy his retirement and I hope I can too. I got off to a rather bad start with some required surgery about a week after closing the deal. I was in the hospital a few weeks and then grounded at home by doctor's orders for several more weeks. This is my first appearance at the office for a couple of hours. Best regards. Maybe I can see you at the reunion this year. I certainly ought to make it as I am foot-loose and there is no good reason why I shouldn't. Sincerely. Argo."

Note that both of these classmates are talking about coming to our 45th reunion and if my memory is correct neither have been to any previous reunion—isn't this great!

From Walter Bagby, '24, we have a note and clipping about another classmate with a keen interest in yacht racing and very involved in racing activities. Walter writes about **Don King**: "Some years ago I called Don a confirmed bachelor. He indignantly refused to accept the description stating that he is still eligible." Well, if Don is still eligible his yachting activity should give him good exposure.

Quoting from the Yonkers *Herald Statesman*: "'Nobody else has the guts to do it,' is Donald King's own explanation of why he has taken on the chairmanship of Larchmont Race Week for the ninth consecutive year. 'Remember, there are 500 geniuses out there on the water, all saying what the chairman did wrong.'

"In addition to his duties with the Larchmont Yacht Club, Mr. King is vice chairman of the race committee of the Storm Trysail Club. He is also a member of the New York Yacht Club auxiliary Race Committee for the Americas' Cup series. He'll be at Newport for the final trials and the Cup races. Don, that assignment on the Americas' Cup series doesn't sound too hard to take.

We have additional clippings and letters but there's another issue coming up and we want to slide this one in under the wire. Keep feeding us your retirement activity stories. Remember Parkinson's Law: "Work expands so as to fill the time available for its completion." So, Cherrio until the December issue.—**George Warren Smith**, Secretary, P.O. Box 506, Pigeon Cove, Mass. 01966

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During the summer we have received word of the deaths of four members of our Class, and we offer our condolences to their families. **James T. Henry** died August 6, 1968. Jim was an active member of our undergraduate group and an interested alumnus; we regret that this is the first word that we have received. Jim came to M.I.T. from Lowell High School and was prominent in Musical Clubs affairs, playing both banjo and mandolin. He married Mary A. McCuster of the M.I.T. Class of 1926. Before World War II, he was power engineer with New Bedford Gas and Edison Light Co., and then served with the navy, being honorably discharged in 1946 with the rank of lieutenant commander. Subsequently, Jim was engineering representative for L.S. Luther and Co. in Washington, D.C. and in 1950 joined Boston Edison. His home was in Wellesley at 42 Sabrina Rd.

We were also late in receiving word of the death of **Westervelt A. Taylor**, who died August 1, 1969. West entered Tech freshman year from Rindge Technical Institute. After securing his bachelor's degree in civil engineering, he obtained his law degree at Fordham University and was admitted to the bar in Queens, N.Y. After 14 years as a practicing attorney in New York, he was named assistant prosecuting attorney in Queens County. The *Jamaica Press* noted at that time that he was the first black to be appointed to a position of such high responsibility in Queens. West subsequently became president of Afram Design Associates in Jamaica, N.Y., attorney for the New York City Department of City Planning, assistant chief counsel for the Community Development Agency and finance analyst to the City Council of New York City.

I regret that I have not much information concerning **John S. Wiebe**, who died December 24, 1969. He came to Tech freshman year from Orange, N.J., and had starred in all high school sports. I recall that he starred also on M.I.T.'s freshman hockey team. Jack's business



L. Woolfenden, '27 Royal Weller, '27

career involved packinghouse by-products as a broker in the Chicago area. In 1948, he was a buyer for Lever Bros. He moved to Chesterton, Ind., in 1954, where he lived at 601 South Calumet Rd., until his recent death.

I would also like to have more to record concerning **Harold L. Van Alstyne**, who was a design supervisor for Hamilton Standard division of United Aircraft at the time of his retirement about 1965. He had received both his bachelor's and master's degree in aeronautical engineering at M.I.T. At the time of his death on August 23, 1969, his home was at 30 Hilltop Dr., West Hartford, Conn.

A small group of us celebrated our "43rd reunion" on June 7 and 8 at the Homecoming in Cambridge. The lunch on June 8 was attended by Eileen and Bill Taggart, Ruth and Joe Burley, President Dike Arnold, Class Agent Dick Hawkins, Art Connell, and me. Bud Fisher had been at the Pops concert the night before but was unable to stay on. Art's wife, Polly, was also at the concert but couldn't make the lunch.

Art Connell retired from Stone and Webster on March 1. He and Polly have no plans for moving from Winchester; they are planning more travel abroad. Art says this may sound like a busman's holiday in view of the heavy travel schedule he had during his working years, but now it will be from the tourist point of view and at his own expense. Their summer house on the North Shore, at Essex, will occupy a part of their time and attention. . . . Ruth Burley flatters these notes by saying that the first she heard of Joe's retirement was in our June, 1969, issue. **Joe Burley** has retired from his post as president of Boston Insulated Wire and Cable Co. There are no plans to move from Milton.

Dike brought the news to the lunch that Bald Peak Colony Club at Wolfeboro, N.H., has confirmed space for our 45th (wow!) reunion on June 2, 3, 4, 1972. That's now less than two years away.

More retirements include that of **Lincoln Davis** from the Foxboro Co. In January. He will be consulting for them for a short time but plans to continue part-time

consulting on mechanical, problems, manufacturing processes and methods, etc. His home is in South Easton. . . . **George Jenkins**, who lives in Winthrop, retired from the aircraft engine group of General Electric, Lynn, in April. . . . **Bradford Stetson** is in his third year of the "new life," after working over 39 years for the Bemis Company, Inc. (formerly Bemis Brothers Bag) in St. Louis and Minneapolis. Address: 2255 Palmtree Dr., Punta Gorda, Fla.

Royal Weller, who has been chief scientist of the Naval Air Missile Test Center at Point Mugu, Calif. and later, director of engineering for the space systems division of Lockheed Missiles and Space Co., has spent the past three years in La Spezia, Italy, working for N.A.T.O. The Wellers are now retired and living on a sailboat with which Royal says they "patrol the Atlantic and Gulf coasts." (That should include a visit to Mystic someday?). . . . A note from **Les Woolfenden** confirms that he and Ethel are enjoying retirement in Paducah, Ky., and are both in good health. Les was with GAF Corp. for 42 years. . . . When I saw **Luke Bannon** seven years ago, he had an orange grove at Sanford, Fla. He recently wrote: "Now that I am retired with the various things which seem to go wrong with older citizens, I am most happy to still be here. Regret inability to visit around but would welcome any visitors here. Miss talking with the group. Would like to again be spending summers in New England."

The United States Atomic Energy Commission has announced the presentation of the U.S. Atomic Energy Commission Citation to Dr. **George B. Darling** "for meritorious contributions to the nation's atomic energy program." We offer our congratulations to our classmate for this important honor and for the work he has done as director of the Atomic Bomb Casualty Commission in Hiroshima. For this undertaking, he also received the Supreme Award of the Japan Medical Association in 1968. The ABCC has been conducting long-term studies of the Hiroshima and Nagasaki populations to identify latent biological effects.

We want to make special note of the retirement of two of our classmates from

full-time service at the Institute; they are **Henry G. Houghton**, Professor of Meteorology and **Charles Kingsley, Jr.**, Professor of Electrical Engineering. Column-long tributes to these professors and records of their careers appeared on pages 85-7 of the *Technology Review* for July/August, 1970. The notes of last May announced Professor Kingsley's new association with the Electric Power Systems Engineering Laboratory at M.I.T.

George Houston wrote Joe Melhado with the following for the notes: "Was shocked to read of Bob Bigelow's death. This makes four who will not be coming to our 45th—Jackson, Spitzli, True and Bigelow. Almost hate to pick up the *Review* these days. We visited Betty Jackson in Amherst, N.H., three weeks ago. She's fine—working as a full-time librarian in Nashua and having fun with her children week-ends. Young Glenn, Bob and Ann are regular visitors. Ann is living in Cambridge and teaching school in Wakefield. Also have talked to Anna True and hope to see her this summer on our trips to and from Maine.

"I have just had the welcome news of my appointment as a full professor of continuing education at Northeastern University. It's exciting work and a fast-growing field helping our contemporaries, and even those younger than we, keep up to date with new knowledge, adjusting to changing events and re-examining outmoded assumptions. There's lots to be done." Many thanks for the word from you, George, and congratulations on the new job.

McGraw-Hill Book Company has published *Electronic Flash, Strobe* by **Harold E. Edgerton**, which presents numerous useful techniques on the industrial and commercial applications of the methods developed by the author, a world authority on high-speed photography using electronic flash and strobe techniques. The book offers a thorough treatment of the theory and application of the xenon flash lamp (and other flash sources), and includes a dimensional analysis of flash lamp design. At an EG&G stockholders' meeting, recently held in Boston, Dr. Edgerton's interesting display of stroboscopic equipment and photography attracted the attention of many. The

meeting reelected Dr. Edgerton a director of the company.

Larry Day was in Mystic on business early last summer. Being a government defense contract auditor, he had work at the office of a local oceanographic company, and came by our house. Larry looked very well and seemed happy with his home in Sachems Head, Guilford, Conn., his office at Bridgeport, and vacation spots in Weekapaug, R.I., Manisota Beach, Fla., and Bermuda. I wish I had thought to take his (or our) picture when he was here. And this is something we all could keep in mind when visiting with other members of 1927 or their families. The *Review* is very good about running pictures with our copy and they can be of much interest.

Another meeting of 1927ers occurred in Chererex S/Nyon, Switzerland, at the home of **Amund Enger**. The visitor was **Ken Smith**. On a joint postcard, "the Count" said he saw few classmates and Ken's visit was all the more appreciated, and he hopes others will do likewise. Ken said that his host was in fine fettle and his home in a beautiful spot. I am writing to both in hopes that a picture was taken of the two.

Bob Bonnar has passed another milestone: 35 years of service with GAF Corporation, of which he is now corporate director of purchasing. . . . **John Parker** has written interestingly to Joe Melhado that, in addition to his ghost house research and architectural work, he has "turned artist and writer. Two of my three entries in an Eastern art show won second place in the professional class, as judged by the Rockport jury." John has plans to exhibit more paintings this year and says "perhaps M.I.T. Dean Emerson's prized book, on my favorite bookshelf, will provide the inspiration."

Having worked across the street from the "M.I.T. Armory" for 37 years, **John W. Harris**, vice president of Metropolitan Moving and Storage Inc., recalls that he has watched the Institute grow all these years and has a hard time believing what he sees today. In the course of this time the Institute has acquired the building in which he works. . . . **Mark Robbins** has checked in to say: "I'm still enjoying retirement but with restrictions. Lots of fishing and auto racing." What restrictions, Mark? . . . **Jim Forbes** retired officially two years ago but continued working on a half-time basis at the M.I.T. Instrumentation Laboratory. Jim says lack of funding at the Laboratory brought these activities to an end in July, 1969 and he is now living in Honolulu. His wife died in 1967 after they had been married 38 years.

Professor **Stuart Barker** has moved from Salem, Ore., to Portland, Ore.; **Maurice Barrangon** from New York City to San Antonio, Texas; Dr. **Emily Bixby** from Wrentham to Lawrence, Mass.; Dr. **E. H. Bramhall** from California to Phoenix, Ariz.—**Joseph S. Harris**, Secre-

tary, Box 654 Masons Island, Mystic, Conn. 06335

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The Class was very well represented at the 1970 Homecoming in June. Attending one or more of the functions were: Beryl and Elbridge Atwood; Jack Chamberlain and stepdaughter, Sally Kingston; Frannie and Jim Donovan; Dorothy and Carney Goldberg; Helen and Bob Harris; Priscilla and Roger Haven; Florence Jope; Claudia and Morry Klegerman; Johnny Melcher; Mary Nichols; Madeline and Hal Porter; Walter Smith; Grace and Ed Ure; and Lucile and Sam Weibel. It was a most pleasant event.

Carroll Smith was kind enough to write bringing us up to date on his interests: "On May 1st I retired from Vitro Laboratories where I have been the last 20 years. The past 10 years I have been doing systems engineering on the Polaris/Poseidon missile program. This work has involved several trips each year to the west coast contractors and one trip to Spain. Our older son is now a captain in the army and is stationed at Fort Knox where he is attending Armor School. He returned last year from Vietnam after spending a year with the 101st Airborne Division. Our younger son completed his undergraduate work in physics at the University of Maryland and is now in graduate school at Caltech. Our daughter will start her third year at Murray State University in western Kentucky this fall—she is majoring in biology. I am keeping busy this summer with my gardening and photography. As soon as the children are through college we hope to do some traveling. Verna and I have many pleasant memories of our 40th class reunion. Members of the Class in the Boston area who served on the Reunion Committee certainly did an excellent job."

The Alumni Fund office has provided us with a good number of news panels from return envelopes. Says **Jack Chamberlain**: "Since retirement from M.I.T. medical department in June 1968, have worked full time as supervisor of the surgical emergency department of Children's Hospital. I am continuing in the practice of pediatric surgery on a limited basis. I serve also as an associate editor of *Massachusetts Physician*, a monthly journal with more than 11,000 circulation."

Joe Gaffney reports: "I am currently recovering from surgery with loss of the main artery of my right leg. The doctors say I will be OK and can resume all activities in a short while. We are moving to the Oak Brook Club (a condominium) at Oak Brook, Ill., in October 1970."

From **Leon Gaucher**: "Retired on August 1, 1969, after 41 years with Texaco, Inc. I plan to continue lecturing on energy sources and writing additional technical papers." We are very sorry to learn that Leon's wife, Hattie Lu, died in January of this year. . . . **Harold Geiger** writes:

"Was Chicago district manager for International Nickel Co. from 1935 to 1969 when I retired. Currently I do what retired people do and follow with interest the career of my son, Dr. G. H. Geiger, who teaches metallurgy and occasionally publishes on the subject."

Leon Locklin reports briefly: "Retired this year from Georgia Power Company—am moving to Lakemont, Ga." . . . From **Samuel Marshall**: "I am working from my home address and writing a book on environmental pollution control. Am still flying and set two official records in May 1969." . . . **Ben Miller** says: "In addition to my medical research I am a busy writer for the general public. My book, *The Complete Medical Guide*, has been widely promoted by the Book-of-the-Month Club." . . . **Don Perry** writes: "Retired from Carrier Air Conditioning Co. in 1969 after 41 years in various sales and engineering management responsibilities both in the field and home office." . . . **Arthur Smith** tells us: "I am currently vice president and assistant sales manager of City Auto Stamping Division of Sheller-Globe Corp., in Toledo. I expect to take the retirement treatment at the end of this year. Dottie and I have been blessed with wonderful health. We have one daughter, one son and five grandchildren to enjoy."

Eight members of the M.I.T. faculty retired last June. Two of them are affiliates of our Class. **Augustus Rogowski**, Professor of Mechanical Engineering, joined the Institute staff in 1936. For the past 10 years he has been in charge of the Sloane Automotive Laboratory and all internal combustion courses. He is a member of the executive board of the Diesel and Gas Engine Power Division of the American Association of Mechanical Engineers and author of the book, *Elements of Internal Combustion Engines*. . . . **John (Bud) Wilbur**, '26, an honorary member of the Class, was retired as consulting professor of civil engineering. He was appointed to the faculty in 1933 and was head of the Department of Civil and Sanitary Engineering from 1946 to 1960.

Merrell Fenske is in the news again, this time as co-developer of a process for desalination of sea water (or other brines) to a potable condition. According to the account in *Research in the College of Engineering 1968 and 1969* (Pennsylvania State University) the trick is to dissolve out the fresh water at high temperature and pressure with a liquid hydrocarbon. When cooled, the hydrocarbon layer releases its acquired charge of fresh water.

A news release from Hearst Magazines informs us that **Al Dempewolf** has been named vice president and general manager of MOTOR Publications. Al has been publisher of MOTOR since 1967. He joined Hearst Magazines in 1960 as Good Housekeeping's director of marketing. Prior to joining Hearst Corp., Al was a marketing consultant and before that advertising director, director of market development, and assistant to the gen-

eral manager of the Celanese Corporation.

With deep regret we must report the death of four classmates. **William I. Gorfinkle** died on August 14, 1970. Bill was seriously ill and home from the hospital only a few days. Besides his wife Ella, Bill left two daughters, five grandchildren and two brothers.

Joseph D. Guertin died on April 19, 1970. His wife, Helen, informed us that his death was quite unexpected although there had been some earlier indication of heart trouble. The Guertins raised one daughter and two sons all of whom have done well. Joseph D., Jr., the younger son, received his S.M. degree from M.I.T.

Ludger Gagnon died on March 5, 1970. We have no further information at this time. His last address in our file is City Hall, Quebec, P. Q., Canada.

Paul T. Rumsey died January 18, 1966, but the information has only now come to our attention.—**Walter J. Smith**, Secretary, 20 Waverly St., Arlington, Mass.

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This is the beginning of my second year as your Class Secretary; my most difficult task has been to collect news items from you fellows. When I receive the postcard reminder from the Review's News Editor that my notes are due in 10 days, it feels like getting a notice of mortgage payment due and not enough money in the bank to meet it. You can help me get over this sense of insecurity by sending me news of any kind about yourselves, family and other '29ers that you know.

Daniel Silverman, Course VI, of Tulsa, Okla., a research consultant for the Pan American Petroleum Corp., retired last June after 33 years of service. Dr. Silverman joined the Standard Oil Co. (Indiana) subsidiary in 1937 as a research engineer in its geophysical laboratory which was then maintained in Los Angeles. He was transferred to Tulsa in 1939 and served in various supervisory positions until named exploration research director in 1949 and geophysical director in 1958. Dr. Silverman was associated with a great number of developments in Pan American's geophysical research. He helped develop Pan Am's seismic instruments and systems, the first small-diameter gamma ray logging instrument, and special underwater seismic and gravimeter instruments for offshore surveys. He has been issued more than 120 patents by the U.S. Patent Office. A native of Montreal, Canada, he received his B.S. in electrical engineering from the University of California in 1927 and M.S. and Sc.D. from M.I.T. in 1929 and 1930.

On the occasion of **Hunter Rouse's** 65th birthday, it is reported that several of his colleagues at the University of Iowa are planning to have his collected works published. Dover has agreed to undertake the publication.

The following members of our Class attended Homecoming 1970: Bill and Doris Baumrucker; Mrs. Robert C. Dean; Wally and Joan Gale; Paul Keyser and his wife; Virgil W. McDaniel; Frank and Marian Mead; and John and Olive Rich.

It is a great honor and distinction to our Class that **Paul V. Keyser, Jr.**, Course X-A, of New York City, has been elected president of the Alumni Association for the coming year. In addition, Paul will also serve as ex officio member of the Corporation during the term of his office as Alumni Association President. He recently retired as Executive Vice President of Mobile Oil Co., after 40 years of distinguished service. Among the positions he held were those of Director of Research and Development Laboratories, Manager of the Lubricating Department, Marketing Manager, and Domestic Vice President. Paul was Director of Foreign Trade, 1955-59; Second Vice President, Planning 1950-60, Executive Vice President in charge of chemicals, 1960-69; and a member of the Board of Directors from 1955 to 1969. He is a director of the Shelter Island Heights Association and Shelter Island-Greenport Ferry Company and is a former member of the Board of Governors of the American Petroleum Institute.

On two occasions this summer while I was driving down Hutchinson Road, past the Winchester Country Club, I ran into Professor **Herman P. Meissner**, Course X-A, of Winchester, Mass., and his wife Dorothy briskly walking down the hill hand-in-hand. I slowed down and offered them a ride. They thanked me and confessed that they were on their daily constitutional—not one mile but over three miles completely around the vast Winchester Country Club. Herman is on the M.I.T. faculty and the way he was jouncing down the hill, it will be several years before he will head for the rocking chair.

Eugene H. Gilman, Course X, of Mountainside, N.J., has sent a brief note saying, "Have retired from Union Carbide Corp. Plan to spend summers in Maine and go to Florida in the winter."

An encouraging note comes from **Edward C. Roche**, Course XI, of Williamsville, N.Y. "You are doing a fine job, Karnig. Keep up the good work. Have not forgotten you and the rest of our classmates attending the 40th reunion. Elmer A. Skonberg's leaving the ranks of the living sure was a great loss to us all."

Clifford M. Wallis, Course VI, of Columbia, Mo., Professor of Electrical Engineering, has retired after 42 years at the University of Missouri. Dr. Wallis received the B.S.E.E. degree from the University of Vermont in 1926, the M.S. from M.I.T. in 1929 and the D.Sc. from Harvard in 1941.

As an instructor at the College of Engineering at U.M.C. Dr. Wallis recalls his beginning salary of \$1,800 per year in 1928. But when the depression hit the university, his salary was reduced to

\$1,700 in 1933. But there were compensations—no Federal or state income taxes and eggs cost 12 cents a dozen. He served as chairman of the Department of Electrical Engineering at U.M.C. for 20 years. Dr. Wallis remembers the academic year 1946-47 as a hectic one; the tremendous influx of war veterans jumped the College of Engineering's enrollment from 350 in the spring term of 1946 to 1,400 in the fall semester of the same year. He has been awarded two Fulbright Lectureships—one at Ankara University, Turkey, and the other at the National Taiwan University at Taipei. Dr. Wallis, commenting at the time of his retirement, said: "During the last 10 years we have awarded B.S.E.E. degrees to sons of a few E.E. students who graduated early in my career here. I think I'd better get out before the third generation shows up." With best regards to you all.—**Karnig S. Dinjian**, Secretary, 32 Oldham Rd., Arlington, Mass. 02174

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While in Japan early in July, I spent a very pleasant Sunday with **John Minami** and his charming wife. John is Professor of Architectural Engineering at Waseda University in Tokyo. After picking me up at the hotel and taking me to their home—which John designed—they took me to lunch at a country hotel where the food and scenery were perfect and then to the Fuji Lake Side Country Club in Yamanashi. It was a wonderful day and a pleasure to see John again for the first time since our graduation.

Frank Simon, whom I hope to see during my next trip to England, writes: "After a career in rapid transit in New York, including being General Manager of the Long Island Railroad and Executive Director of the Metropolitan Rapid Transit Commission, I moved to London in 1959. In addition to my position with John Brown Engineering (steam and gas turbine builders), I am also a director of John Brown & Co (Overseas) Ltd., English China Clays Ltd. and British Smelter Constructions Ltd., so you see I am kept pretty busy." . . . **Hugh Vivian**, whom I also hope to see during the next trip to the U.K., has remarried and has several new daughters. I am looking forward to hearing more about his wartime and business experiences.

Hope and **Randy Binner** haven't changed a bit since the last time I saw them. Louise and I had dinner at their new house recently and thoroughly enjoyed not only seeing them again but also the dinner and their new house at 786 Cheese Spring Rd., New Canaan, Conn., 06840. . . . Colonel "**Irv**" **Finberg** reports that **Don Grieco**, "**Gab**" **Cristofalo** and he had a minor Course XVII reunion in Miami when "**Gab**" who recently retired from F.A.A. spent a few months there. It came about as "**Irv**" works in Miami. They have all agreed to get together again at the 40th reunion. . . . A note from **John McNiff** says: "I have moved from Boston with Simplex Wire and Cable

Company to North Berwick, Maine. . . . It has only a few hills but this Spring has been beautiful. I'll miss the I.E.E.E. and A.S.O.C. meetings but will travel to Durham, N.H., for a few."

John Tucker writes: "Since graduation (I) only spent the first six months and the W.W. II years in engineering. (Am) currently vice president-marketing, West Side Federal Savings & Loan Association in Cleveland. (We have a) daughter in Portland, Ore.; two grandsons; a son in Cleveland, no children, (who is) working for I.B.M. Just bought our retirement home at Seven Lakes Country Club in Palm Springs, Calif. (Retirement is) three or four years away." (Note: John, when you get to Palm Springs be sure to look up Colonel Fred Elser, another classmate, who lives there.)

Captain **Oscar Stiegler**, U.S.N. ret., tells that he has joined the ranks of those mandatorily retired because of attaining that "magic age of 65." . . . **Ben Mesick**, who is retired, has written: "Under an assignment from the International Executive Service Corps, I carried out a project for the Republic of Singapore, 1 July to 15 November, 1969, in connection with training centers for technicians in metal cutting and precision engineering industries." . . . **Everett Swift** reports that he is retiring June 30, 1970 and will move to Cape Cod. . . . Rear Admiral **Arnold True** seems to have a hard job retiring; he reports that he retired from the U.S. Navy in 1946, from teaching in 1968, and is now active in cattle ranching. . . . **Russ Pierce**—with whom I talk by ham radio every so often—is retired and says his hobbies include sailboat racing and concert recordings in addition to ham radio. (Note: Russ is also an expert in locating underground water by divining rods.)

Classmates who attended the 1970 Homecoming in Cambridge this year included Gordon Brown, Ralph and Mrs. Davis, Ed Hubbard, Daniel Johnson, Art and Mrs. Newell, Russ Pierce, Howard and Mrs. Richardson, and Vince and Mrs. Damiano.

Two classmates attended the recent Mexico City M.I.T. Club Fiesta, **Alvino Manzanilla Arce** and his wife Irma, and **Tufic-Antonio Chemor**.

Rear Admiral Cato's book *Command Performance with Guts* received an excellent review in the Naval Academy's publication *Shipmate* for April. . . . A clipping from the *Wall Street Journal* announces **Emilio Collado's** election as a director of J. P. Morgan & Co. (New York) and of the Morgan Guaranty Trust Co., a subsidiary.

Since the last notes, reports have been received of the deaths of **F. W. Suhr** and Colonel **Harold H. Carr**. Our deepest sympathy to their families.

Don't forget to reserve the week-end of June 11 to 13, 1971, for our 40th reunion at the Bald Peak Colony Club in Melvin Village, N.H., As soon as plan details are

a little further advanced, they will be reported in your class notes.—**Edwin S. Worden**, Secretary, 35 Minute Man Hill, Westport, Conn. 06880

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Frederick (Ted) Alexander, Jr., discloses a fascinating career with his note telling of his retirement. Ted has documented and written the history of the Sandia Laboratories. He joined Sandia in 1948 and in 1950 headed the production and engineering methods division. In 1960 he became interested in the need for a history of the Laboratories and his first work was published in 1964. In producing it he became an authority on the history of aviation and atomic weaponry in Albuquerque and since then has prepared about 35 histories of specific weapons. His older son, John, is a Presbyterian minister in North Carolina, and his younger son, Robert, is a medical technologist in the U.S. Navy at Bethesda, Md. Ted and his wife Dorothy have many plans for retirement, but between trips will be returning to 1517 Figueroa, N.E. Albuquerque, N.M. 87112

Benjamin Wilbur has retired from the position of senior mechanical engineer, Ordnance Systems Department, General Electric Co. and is still living at 14 Baldwin Ave., Pittsfield, Mass. He writes that he is learning to maneuver a 30-foot house trailer and car. . . . **Robert West** is retired and writes from Silver Springs, Md. that he is taking guitar lessons from a flamenco guitarist. . . . **Leo T. Tyburski** is spending the summer at his cottage in the Poconos and is contemplating another trip to Europe—probably to Scotland and Wales.

John Wm. Leslie has completed 35 years with the New England Division, U.S. Army Corps of Engineers, where he has been chief-engineering division for the past 15 years. Two sons have graduated from M.I.T., Alan '65 and Stephen '70, and his daughter Christine is a senior at Jackson. John discussed "Improvement of the Lower Charles River" at the July meeting of the American Society of Civil Engineers in Boston.

Professor **Carroll L. Wilson**, of the Sloan School of Management at M.I.T., launched an experimental master's degree program under the name "Program for the Social Applications of Technology." One summer study project, which is considered a prototype for the projects to be carried out under the Program, will study critical environmental problems and do the ground work for a 1972 United Nations Conference on pollution.

Addison Hall has been elected president of the New England Chapter of the Society of Fire Protection Engineers. Objectives of the Society are to promote the science of fire protection engineering and to foster fire protection education. At the first annual seminar of the Chapter in April such subjects as new adjuncts to the automatic sprinkler to

meet the problems of modern industry were presented. Addison lives at 11 Downing St., Hingham, Mass.

From the Alumni Records Office we are notified of the deaths of Colonel **Ralph H. Bassett**, of El Cajon, Calif., on January 6, 1970; **Eugene P. Worthen**, of Braintree, Mass., on Dec. 4, 1969, and Miss **Helen S. Burnham**, of Leominster, Mass., on January 30, 1969.

The special reunion in Spain last June was attended by 23 couples and one single. I expect some letters from those who attended and will sprinkle them through the notes in the next few months. I hope this will give us all a description of what happened and will stimulate enthusiasm for our upcoming 40th reunion in 1972 for which reservations have been made at one of the new residence halls on campus.—**Elwood W. Schafer**, Secretary, Room 13-2145, M.I.T., Cambridge, Mass. 02139; **James Harper**, Assistant Secretary, 2700 South Grant St., Arlington, Va. 22202

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Well Sir, we are off and running again on the next volume of the ever famous and top-notch magazine published by your Alumni Association; the very best in the land. This column is destined to be shorter than usual because of circumstances beyond our control.

First, the personals—material sent in to me freely and without prompting(?). From **Raymond L. Brown**, Electrical Engineer extraordinary, erstwhile of Connecticut but now of Basking Ridge, N.J., comes news that after September 1 he will be in France. Ray is, apparently a very important cog in the Singer wheel, specializing in small motor design and adaptation to the Singer products (not named here). Ray and Jo have already found a home in Bonnières-sur-Seine, a hamlet not readily located on any available map. But it must be not too far from Paris as the Singer plant must perform be near a population center for a valid reason—they need employees in droves. The Browns have ready for them a small ranch-type home on a hillside overlooking the Seine in a village which appears to have a combination of the very old and the brand new.

This can happen but only in countries like France. The effect is charming, if my observations are valid. Ray's title will be Technical Director, Compagnie Industrielle Singer. Heck, maybe this guy makes sewing machines, though he vouchsafes not. The position calls for advancement of design of small motors in a plant, both modern and fully automated, and the motors promise to be equally modern in concept and in production. Son Ronald will remain in the U.S.A. He is at Boston College, as of now a sophomore, and has every intention of becoming a lawyer. Ray says, modestly, that he will probably be a good one. This has an element of prophecy in it, no? I

know that Ray's old friends might well wish to write him when he gets to France. If so, I have his address, come mid-September, and will make it available under the usual conditions. Ray, that was a very interesting letter, and I appreciate it no end. Please consider it to be just a sample, and continue; once a month is often enough. And Jo, will you not join my growing group of gals who write the Secretary often, in place of the more modest classmates?

Three times I have made mention that **Norm Spofford** was the son of our old Professor Spofford. This time, I got the expected response, thrice: once from our retired civil engineering professor, John Babcock; once from the engineering firm of Spofford, Thorndike and whasisis, and the third from an unconnected source. Professor Babcock was cordial but emphatic, and the facts are now all in. Norm is not a son as stated and he very emphatically ignores me, as is his wont on many occasions. The firm of Spofford, etc., etc., also was emphatic but impersonal, as one might expect. So that no one gets an excuse to miss the point, many times I slip in an inaccurate statement as fact in the wild hope that I might get a comeback, and, the Lord Be Praised, I always do. Way back when, we reported on some commission executed by **Gordon Bunshaft's** architectural firm; at Yale, I think. I purposely used a wrong first name for Gordon, and I got 7 to 8 kick-backs, from nominal to scathing. The point is that I did get replies, but not from Gordon—Oh, no! So much for a purposeful error.

From **Morris Guralnick**, of the San Francisco Guralnicks, comes an explanation of an address change; I now quote: "Mostly I stay on the West Coast, or close by, as there isn't much too attractive elsewhere." Haw! How provincial can one get? Morris makes all the local and regional Alumni Association events. The G's have a new grandson yclept David Rubin Guralnick, born in the spring, 1970. He is No. 3. Son Steven is Assistant District Attorney in San Francisco. Also, he avers, no arrests or convictions, because that sort of thing is too expensive. Now, that's Morris! Nothing about immorality, legality or weight loss (to paraphrase one of our best). Thanks for the nice note, Morris. We all appreciate your sending it in.

To our intense surprise, and satisfaction we have a two-page letter from **George Wrigley, Jr.**, of Greenville, S.C. He moved from one home to another so we followed the usual procedure and asked why! The "why" is still obscure, though they did move from the old home, with its two-acre grounds to one that is but one acre, and that mostly wooded. Maybe the wooded is the answer. George cannot practice his short irons now and his handicap has gone up from 6 to 9. Was that handicap for the first hole, George? If not, you are way out of my class what with my 18 at Canterbury, Cleveland. Never fear, the cats and the dog will love them woods, son. George

and Charlotte have been married since 1941. He served with the 117th Naval Construction Battalion during WW II and it seems that the battalion followed the Marines into Saipan, apparently to find out that everything was properly secured. "When I got home I met my daughter Ann (now 25) for the first time." Daughter Caroline came along soon after, with proper consideration for the accepted gestation period. Today, Ann is married to a marine officer, and has two children, and lives in California.

After Caroline, George III appeared, again per schedule. Both the younger ones are in college; Caroline at Converse, and George at Wofford. They both seem to be surviving academically. Incidentally, George is Chairman of the Board of J. E. Sitrine Company, of Greenville, S.C., a firm of engineers and architects who specialize in the design and supervision of the building of industrial plants. Probably Beau Whitton gets a shot at some of this building, as he is one of that small sector of fine builders. George signs off by remarking that he often wishes that he were a golf course architect (like Robert Trent Jones, mebbe). George, we all appreciate your taking time out of your busy life to remember your classmates. Many, many thanks, and how I would love to hear from Charlotte. By golly, these gals who write me ought to be recognized as a club, and it is not a remote possibility. C'mon Charlotte, lets hear from y'all, and soon, wont you?

Again pops up our irrepressible **Richard (Dick) Morse**, and a boon he is to a hard-to-please secretary. Dick, it seems, is now Vice President of the Board of Directors of the Dressler Industries, Inc., Dallas, Texas. Y'all must know that Dick is Senior Lecturer at the Sloan School of Management at M.I.T. Dick has, deservedly, been covered these many times, so we hesitate to try to gild this particular lily. Great stuff, Dick, and more power to ya.

From EG&G comes an elaborate press release about their annual meeting, held in Boston, in April. Our own **Herbert E. Grier** was elected Senior Vice President, a one jump up. I can't get anything out of Herb, but I have every hope that Mrs. Grier will continue friendly enough to write for him, if indeed she has. Mrs. Grier, we have every right to expect family news of this quite remarkable man and you apper to be elected as family scribe, with limited scope, but enough to satisfy Herb's classmates.

Under a news heading in *Forbes*, **Ivan Getting** gets a quick one concerning his compensation as head of Aerospace, all of which is covered in the August interim letter to y'all. I mention it again to make sure that Ivan gets his share of the limelight. He is one of our dang well good ones, and deserves all the mention that we can give him.

We have a few Alumni Fund Capsules—always good and usually helpful. From

Ralph L. Garrett, long since missing but not lost, comes a short one. He is still a state fire marshall for the Commonwealth of Massachusetts. No news except that he bewails the fact that he made out his check to the Alumni Fund for the year ending July 1, but he forgot to mail it. Well, that means two checks this year, Ralph, and the only harm done is that you deprived Ken Brock of a miniscule chance to brag a little bit more for the year 1969-70. Thanks for the info.

I probably should have known it, were I a mind reader, but **Francis T. Hall**, retired from his position as full professor at Pennsylvania State University and since then (five years) he has been Dean of Engineering at B.U. He and Florrie have moved to the Cape and good old Francis can't seem to retire. He has taken a job teaching at the Dennis-Yarmouth High School—with much attention, now, to his favorite hobbies, gardening, boating and fishing. I betcha he is a good teacher and knows his stuff. Thanks, Francis, you are a nice fella to write your old grandpa.

Now comes our old drop-out friend, **Fred Aldridge**. He dropped out of Course II, and into Course VII, and made himself a world figure in public health. He has been appointed chairman of the Environmental Task Force for King's County and Puget Sound, Washington, which handles their comprehensive Health Planning Councils—an executive job if I ever heard of one. Fred is also on the Technical Committee of the Stanford Research Institute Health Management study Team. Atta boy, Fred. You would have made a great mechanical engineer, too, probably. Thanks for your contribution to the Fund and your note to Ye Scribe.

From **Frank Heselton**, comes something I can't use—a promise to write later. Now, friends, the Mexicans call it mañana. OK, Frank, I await the future news, but will continue to eat and drink until the word gets here. Thanks for the message and the promise.

Russell (Russ) Eddy has an interesting observation. "The Chinese gal who adopted us while we were in Taiwan has now married a G.I. and has come to the states with him, and will attend Cornell come fall. Ithaca is about one hour from our home. No generation gap here when the kids adopt the parents, what?" Thanks, Russ, for this most timely, and appropriate bit. Russ adds nothing to the above, but then, I do hear from him irregularly. As all may see, we love anything at all sent in by classmates, as it all has interest.

We have a few address changes; two in fact. **Milton G. Davis**, Chemical Engineering, X, and, again, **Alton J. Deutser**, MG XV. Alton seems to appear very often indeed in the address-change department. Is moving cheaper than paying rent? Mebbe so. These addresses, as usual, are available to all on request

when accompanied by a short biographical sketch, securely attached.

This column is just a bit short but you chaps are not neglected, as will be noted when the interim letter is added in. I am the fella that is neglected by far too many of the faithful (?). Best regards to all, and look for the next column in December.—**Warren J. Henderson**, Secretary, Fort Rock Farm, Drawer H, Exeter, N.H. 03833

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From Cal Mohr, '33, an unfailing source of information on the Chicago area, come two clippings about some of our classmates. **Robert C. Gunness**, President of Standard Oil Co. (Ind.), is chairman of the recently founded Chicago Construction Users Council. This group has been formed by major Chicago companies involved in extensive building programs with the specific purpose of trying to arrest spiraling construction costs. They will try to eliminate overtime work except for emergencies, eradicate unrealistic work practices that reduce productivity and set reasonable completion dates for construction work.

The other news concerns **Art Conn** who had been honored by election to the presidency of the A.I.Ch.E. We are extremely sorry to learn that Mrs. Conn died shortly after their return from an official trip to the Israeli Chemical Engineers meeting and a vacation in the Far East. All of us, particularly those who had known Art in the Musical Clubs, would want to extend our sympathy to him and his children at this loss.

We have a few brief notes that came in with Fund contributions. **Donald N. Adler** writes: "I am employed by John Hancock Insurance Co. as designer-consultant relating to agencies' layout and construction. Two boys are no longer at home. Both are in professions and doing well."

If you have lived around New York in recent years, the following from **Vito P. Battista** will be familiar: "The Institute of Design and Construction which I founded about 20 years ago now has a student enrollment of nearly 750 young people, training to become architects and engineers."

"I have been elected to the New York State Assembly from the 39th Assembly District, Brooklyn, and will be the new Republican district leader starting June 23. In the Assembly I am trying to reflect the thinking of the architectural and engineering communities, as well as the people from my community." What he doesn't mention is that he is well-known over the years for his efforts to preserve neighborhood communications and to bring some degree of economy to New York City affairs.

The Alumni Association office has notified me of the death, on July 17, 1969, of **Robert A. Ghelardi**. I am particularly

sorry that such news reaches the M.I.T. community so late. The latest Alumni Register only shows him as living in Bloomsburg, Pa. Can anyone give me more information about his work, etc?

Also from the Alumni Office comes a notice that **Howard Reichart, Jr.**, is now living in Larchmont, N.Y. From this we deduce that Union Carbide has brought him back to headquarters from his assignment in Switzerland.

If you can't get your classmates to tell you what they're doing, the next best thing is to keep tabs on them through your wife's alumni magazine. From the *Simmons Review* we find that **Charlie Lucke** (maybe for this item we should call him Mr. Agness Luck!) and Agness, after being involved in a wedding last Thanksgiving, left last November 29 for a business trip to England and Germany. While there, they spent a week with their daughter and son-in-law in Paris. This was apparently not the time for them to be in Europe because Agness spent the holidays recovering from bronchitis and a sinus infection.

This is written just after a short but beautiful cruise from Portsmouth, R.I., to the Cape with friends from Long Island. We spent one night in Edgartown Harbor and went ashore for dinner at the Harborside Inn, the scene of last year's reunion. The food and scenery are still as good as they were a year ago.

By the time you read these notes, we'll all be back from summer vacations. If you had an interesting or unusual one, how about sharing it with the Class.—**R. M. Franklin**, Secretary, Satucket Rd., Brewster, Mass. 02163

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I have a distinct feeling that I have been along this road before. Ten years ago I wrote my first class notes relating the good time we had at our 25th reunion. This time it is our 35th. Thirty-four classmates with 36 wives and children were in attendance for all or part of the festivities at the Chatham Bars Inn which included all the things we did five years ago plus more sitting around and talking. One of the high-lights Saturday evening was the violin playing of Marybrent Debes, second daughter of **Charlie Debes**; she just graduated from B.U. A large group went on to Cambridge for the M.I.T. Homecoming festivities (including buffet supper and the Boston Pops) after the shore dinner Sunday and stayed over for the Alumni luncheon on Monday. **Bob Forster** is to be commended for the fine job he did organizing the reunion.

At our Sunday morning class meeting, the following officers were elected to serve until our 40th Reunion: President, Robert Forster; Chairman of the 40th Year Reunion, Rufus Applegarth; Assistant Reunion Chairmen, Charles Bowen and Prescott Smith; Vice Presi-

dents and Area Chairmen, Jack Ballard, Jack Colby, Ned Collins and Charles Debes; Secretary, Allan Mowatt; Treasurer, Arthur King; Class Agent, Leo Beckwith. Bill Abramowitz continues his 10-year term as Class Estate Secretary and 40th Reunion Gift Chairman. The President has the authority voted at our 30th reunion to appoint two more vice presidents subject to approval of the Steering Committee.

A telegram from **Lars Ekwurzel** and **Jack Colby** was read at the business meeting and triggered a long discussion on the best methods to increase participation in the nomination and elective process. It was finally voted that the President appoint a representative committee of five or more to come up with proposed changes in the By-Laws to present to the Class by mail within one year. The Nominating Committee included Leo Beckwith, Chairman, Irving Banquer, Ned Collins, Jack Colby, Ham Dow and Pete Grant.

Back in May one of my frequent business trips took me to Greensboro, N.C., where I stayed at the lovely home of Frances and **Edward Loewenstein** for two days. As you can imagine, two crew buddies after 35 years had a lot to talk about. One of the high-lights of the visit was a drive around Greensboro after supper one evening with Ed pointing out the various and sundry residences, factories and public buildings he and his architectural firm had designed. We parted with the plan that this fall he and Frances would drive up to Williamsburg and meet Doreen and me who would come down from Newtonville, and we four would "do" the area together. So it was quite a shock when I was notified that Ed had died suddenly of a heart attack on July 12. I am sure I speak for many of us in sending Frances our deepest sympathy for her loss which is ours too. And I am glad for those two May days.

Another business trip took me to New Jersey in July and I succeeded in getting **Sam Brown** to play hooky from his job as Chairman of the Board of Coverdale & Colpitts and play a round of golf at his club, Canoe Brook, which, incidentally, has two beautiful and challenging courses. Sam explained that he could not get to reunion because he was in British Columbia at the time helping to dedicate a new deep-water port which is 75% owned by Kaiser Steel, a company of which he is a director.

I suppose all you tennis buffs and sailors have been grinding your teeth and wondering when all of the golf talk would be coming. Here it is: you may want to skip the next few paragraphs!

Our Tenth Annual Class Golf Tournament was off to a late start because I wanted to see if we could interest some new classmates at reunion. **Robert Flood**, who captained the M.I.T. Golf Team in 1935, and **Dexter Clough** signed up to make a full flight of 16. Bob plays at

Winged Foot in Larchmont, N.Y. and Dexter at Penobscot Valley in Bangor, Maine. In the very first round my rush for a second leg on the President's Cup was stopped when **Bob Forster** beat me on my home course 2 and 1. **Sid Grazi** who already has two legs on the cup was also knocked out in the first round. He was beaten by **Art Marquardt** who has won the cup once. **Ham Dow**, the only other man to have two legs on the cup, was eliminated in the second round by **Ned Collins'** "best round I have ever had in 20 years of golf." Quarter-finalists in the Championship Flight are **Dick Bailey, Ned Collins, Al Johnson** and **Art Marquardt**. In the Consolation Flight, they are **Dexter Clough, Ellis Flink, Sid Grazi** and **Allan Mowatt**. I anticipate playing my match with Sid in Denver while on an up-coming business trip.

Here's an interesting letter received from **Ham Dow**: "Killing two birds with one missive today: trying to live up to your praise for my good letters and to rush a card in on time. Neither I nor **Gerry (Rich)** has had a chance to reach each other to play golf together since your letter to me of June 30th; so when your note of July 8th arrived Friday I decided to play a game with other residents here. You will note from the enclosed card that we are now playing the full 18 holes. The new holes opened on July 1; but having come up with a lame back on the Fourth, I played the new holes only once before Saturday. Needless to say, you can see how pleased I was with the results. (Net 65!) My chipping and putting was super as they have to be for me to score well; I had 31 putts. As to being a correspondent, I don't get around as you do so I rarely have much that is newsworthy for '35ers. Had Edith and I gone East for reunion as planned, we would have missed a visit from **Elsie** and **Bill Dunn** who made a trip from Hawaii to see friends and relatives in New Mexico and California. We enjoyed their short stay and showed them The Villages. They have one grandchild by a married daughter now back in Honolulu and expect another this year via their son now in Albuquerque.

"We have no news or announcement re Merrilyn. She went East to Chautauqua to participate in a seminar and more piano work after spending 3 weeks at home. Last week she called excitedly to report she had won a special scholarship for which she had auditioned, this being only the second time it has been awarded. It may be a toss-up as to whether an MRS or a PHD will come first for her."

Art Marquardt brought me up-to-date on his children during one of our telephone conversations. Arthur 3rd is now with the Nuclear Division of Combustion Engineering, training Navy personnel. Ann graduated from Western Reserve and was married in August. Gretchen, 19, finished Bennett College near Poughkeepsie and is going to Arizona State University at Tucson for her last two years.

A short note arrived from **Ned Collins** as he was about to leave for vacation at Freeport, Grand Bahama Island. "I am working for the Public Facilities Dept. of the City of Boston. My immediate responsibility is as Construction Coordinator for all work being done on the 3 city hospitals, including the new rebuilding program for the Boston City Hosp."

When I sent the golf tournament schedule to **Paul Daley**, I received the following from his wife, Betty: "Thank you for your letter to Paul, but I must quickly reply so that you may be able, at this late date, to match Mr. Dow with someone else. A month and a half ago Paul had a severe stroke and at this time will be unable to carry on his regular activities. I do hope you'll be able to fix this matter up so that the tournament won't suffer." Paul, we all hope you will be able to resume your former activities soon. Paul lives at 1310 Garfield Ave., Aurora, Ill.

Phoenix Dangel who wrote the class notes for the last three years was always diffident when it came to telling about his own family. I will take advantage of my new office and bring you up-to-date. Sarah seems able to keep busy even with all three sons away from home. Her chief concern, and Nix's too, is whether youngest son Robert will be drafted and have to go to Vietnam. He is working and living in Cambridge between his 4th and 5th years at M.I.T. If all goes well by next June, Robert will receive his B.S. and M.S. in chemistry. Oldest son Philip in this all-M.I.T. family got his doctorate in metallurgy and is now with Chase Copper in Cleveland. Second son Stephen got his M.S. in mechanical engineering and went into the army where he is a lieutenant in the Army Ordnance Corps; he is stationed in Maryland.

We received two belated reports of the deaths of **Louis Birchall**, who died May 19, a week after open heart surgery, and **John J. Ryan** who died November 10, 1969. If any classmates can tell us more about Louis or John, I am sure the rest would like to know it. In the meantime I am extending our sympathy to the nearest of kin.

Finally, I would like to appeal to the wife of a '35er who may be reading these notes, especially if *he* thinks he doesn't have time to write. Won't you take a few moments and tell us what your children or your grandchildren are doing, and incidentally what you and your husband have been up to. I promise that I shall acknowledge each and every letter.—**Allan Q. Mowatt**, Secretary, 16 Beaumont Ave., Newtonville, Mass. 02160

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The Bunker-Ramo Corporation has a new President, Chief Executive Officer and Director as of last April—**George S. Trimble, Jr.** George was then a Vice President of Martin Marietta Corporation,

having served as Deputy Director of the Manned Spacecraft Center of NASA in Houston from October, 1967, to October 1969. Bunker-Ramo manufactures, sells and leases electrical and electronic components, systems and services and produces and sells knitted deep-pile fabrics. . . . **Pete Weinert** has been appointed vice president for technical service for the process division of Universal Oil Products Co. He has been with the company since 1936 and director of the department since 1968.

Donaldson McMullin writes that he has established a partnership with an associate of many years. The new firm: McMullin Staniunas Associates, architects in Wellesley. The McMullins also became grandparents when their older daughter had a boy in April. . . . **David Varner** writes from Washington that he continues as a partner in the patent law firm of Cushman, Darby and Cushman.

Stanley Stolz makes the most of his free time sailing a 26' Pawnee sloop and serving as rear commodore of the St. Croix Yacht Club. His working hours are spent serving as assistant director, Division of Environmental Health for the Virgin Islands government. . . . Another in public service is **Louis Proulx** who is chief of the Air Pollution Control Section of the Connecticut State Department of Health. . . . **John Valtz** notes that the architectural firm of Valtz and Kimberley, Inc. was formed nearly a quarter century ago with John as president and treasurer.

Ruth Humphrey Perkins writes with pride of the birth of her fourth grandchild, a daughter to her son Dr. David Perkins and his wife. . . . **Glenn Soash** has retired from du Pont and Colonel **John Meeks** has retired from teaching physics at the Citadel. He is presently residing in Charleston, S.C. . . . **James Craig** has left Union Carbide after 32 years and has continued as a consultant for two of their Linde Division Distributors. He is now general sales manager for one of them: County Welding Products of White Plains, N.Y. . . . Many of the foregoing items were sent in with contributions to the Alumni Fund. On both counts, thanks from your Secretary.

1970 Homecoming brought Hal Miller, Herb Borden, Ed and Rose Dashefsky and Leo and Fran Kramer to Cambridge. If there were others they were unrecorded and since I was traveling north in Montana between Yellowstone and Glacier (in the rain) I can not vouch for the accuracy of the record. I did glean an item from the *Denver Post* of June 14, datelined New York, with the headline, "General Dynamics Eyes Knudsen." Having been incommunicado most of the time since then I have not seen anything further. After two weeks base-camped in Humphreys Basin in the high Sierras I am gradually returning to reality and by early October I shall be back at the old stand.—**Alice H. Kimball**, Secretary, P.O. Box 31, West Hartland, Conn. 06091 or 100 Memorial Drive, Apt. 8-6C, Cambridge, Mass. 02142

Our Class was represented at the 1970 Homecoming by the following members with their wives: Ross E. Black, Wyn Gay, Fran Houghton, Phil Peters and Walt Wojtczak. It is not too soon to start thinking of our 35th reunion which comes up in June 1972.

I received a notice that **Bob Rudy** attended the Mexico City M.I.T. Club Fiesta. From the brief comment on the postcard, I gather that he participated and had a grand time. . . . **Phil Peters** has been elected a member of the Corporation of the Institute for a five-year term. He is also a director and vice president of the Greater Boston Chamber of Commerce and is west division chairman of the 1970-71 Massachusetts Bay United Fund Campaign. . . . **Albert C. Hall** has been elected to the National Academy of Engineering. Membership in the Academy is the highest distinction that can be conferred upon an American Engineer.

Curt Powell has recently been promoted to professor of naval architecture and marine engineering at the Institute. . . . Miss Sondra R. Zemansky, daughter of **Stan Zemansky**, is a freshman at the Institute. . . . **Charles N. Griffiths** represented the Institute at the Inauguration of the President of Hartwick College. . . . **Dick Young** is now in London; he has been elected a vice president of Arthur D. Little, Inc. and is managing director of Arthur D. Little Ltd., the company's British subsidiary.

John B. Corbett is now in the real estate business selling houses for Herving Realty. . . . **Sidney Sussman** is technical director of Olin Water Service Laboratories since purchase of Water Service Laboratories by the Olin Corp. His son, Carl, is a research assistant at the Urban Systems Laboratory. . . . For the last five years, **Ed Peterson** has been engaged in professional consulting work in metal rolling. . . . **Bertram Wellman** is semi-retired in Otsego County, about 10 miles from Cooperstown and the Baseball Museum. He is free-lancing, selling electronic products.

Fran Houghton remarried in 1969 to Elizajane Schaeffer. He is presently with the New Hampshire Water Supply and Pollution Control Commission. . . . **Phil Dreissigacker** reports his oldest son is now out of Brown and the youngest is at Stanford.

It is with sorrow that I report the death of **Archver Nicholas Ahmadjian** who died in Ann Arbor, Mich., on June 25. At the time of his death he was employed by Ralph M. Parsons Construction Company of Los Angeles, Calif., and was resident construction manager for a nuclear power plant being built at Monroe, Mich., by the Detroit Edison Company. He leaves his wife, Louise, and two daughters, Mary of New York City and Anne of Ann Arbor. During World War

II he was a major in the Army Engineer Corp.

I have also been informed by the Institute that the following members of our Class are deceased: **John F. Fitzpatrick** on January 25, 1970; **Louis L. Touton, Jr.**, on February 15, 1970; **Baird W. Hodgkinson** in March, 1970; and **G. Richard Slonneger** on April 16, 1970.—**Robert H. Thorson**, Secretary, 506, Riverside Ave., Medford, Mass. 02155; **Curtiss Powell**, Assistant Secretary, Room 5-325, M.I.T., Cambridge, Mass. 02142; **Jerome Salny**, Assistant Secretary, Egbert Hill, Morristown, N.J.

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Alumni Homecoming in June had the biggest 1938 attendance that we have ever had in an off-reunion year. The Boston Pops Orchestra was great; the punch did turn out to be excellent and the company was delightful. In addition to your Secretary, Frank and E. Gardner, Al and Carroll Wilson, Don and Phyl Severance, Bob and Pat Johnson, Harold and Mary McCrensky, John Glacken, Norm Leventhal, Jim Ferry, and Howard Millius were also in attendance. Present plans are that the Pops performance will be repeated next year, so keep this in mind for 1971.

A clipping from the *New York Times* announced the marriage of **John Cook's** son, Warren, last June and indicated that John is currently president of the Fabrics Corporation of Bennington, Vermont. . . . **Paul Gillon** writes: "Have been retired from the army for a long time; however, am associated with it again as the representative of the Ford Motor Company for the European Theatre. Have been here for a year and will be remaining for another." . . . A note from **Bill Gibson** reads as follows: "Still semi-retired—eking out my retirement income from foreign service with part-time work with H & R Block (Income Tax) and Seaboard Planning (Mutual Funds, Life Insurance and Mineral Funds). Civic responsibilities taken care of by U.S. Coast Guard Auxiliary activities." . . . **Dwight Kennard, Jr.**, also reports: "Have just been named director of the Technical Institute, a division of Northwestern Michigan College, Traverse City, Michigan." . . . **Arthur Gould**, who is a professor at Lehigh, was elected to the joint student-faculty-administrator assembly at Lehigh. As the name would indicate, the assembly will give students and faculty a larger participatory role in the decision-making process. . . . I received notice that **Ralph Slutz's** son, Eric, has been admitted to the entering class in September at M.I.T.

I will close this month's notes with a very interesting letter from **Donald Macdonald**: "When we met at the 25th reunion, I had just finished a year at the National War College (and my 16th in the Foreign Service), and Jeanie and I were about to leave for our first European assignment after two in Korea and one in Turkey. We had a fascinating three years in Geneva. I was concurrently a part of our Mission

to International Organizations there and permanent executive officer of our delegation to the disarmament conference. When the conference was in session I worked part of the time with Bill Foster (an M.I.T. alumnus), who was director of the Arms Control and Disarmament Agency and frequently headed our delegation himself. Except for the small permanent cadre in Geneva, most delegation members came from Washington for a few weeks at a time, and those of us who stayed provided continuity. Between sessions, along with keeping the delegation facilities and files in readiness, I put in some time as consultant to the Policy Planning Council of the State Department, and doubled for six months as acting labor officer of the Mission in its relations with the International Labour Organization.

"We got to see quite a bit of Switzerland during our tour. Jeanie learned to ski, and passed the initiation rites by breaking her leg. I learned a little more about sailing than I knew at M.I.T., when I nearly turned a dinghy over on the Charles my first and only time out, but even three years on Lake Geneva wasn't enough for a landlubber like me to learn. On our way back to Washington, we toured Eastern Europe as far as Istanbul, where our second son was born. Of the many impressive sights on that trip, nothing impressed us so much as the sight of the house we had lived in fifteen years before in Istanbul: then, it had been a one-story bungalow with two or three others, surrounded by pasture and cropland; but in 1966, it was in the middle of a bustling suburb of over a hundred thousand people, and the house itself supported two additional storeys of tenements. Such is the pace of Turkish development!

"Returned to Washington, I put in nearly three years doing liaison work between State and the other members of the "intelligence community" (a select part of the intelligent community, one might say) in Washington. Then I decided to take advantage of early retirement and start something different. An offer of a job with Operations Research Incorporated of Silver Spring, Maryland, precipitated the change. ORI has a branch office here in Carlisle to provide scientific support to the army's Institute of Advanced Studies (co-located with the Army War College). I have been coordinating one of the various study projects, involving about a half-dozen researchers in various social science disciplines and operations research specialists. We are settled in a big old farm house in the country west of town (the family, that is). Jeanie, who was assistant editor of the Washington International Center's newsletter while we were in Washington, has started work on a master's degree in education, while in my spare time I work on my Ph.D.

"Carlisle is close to the Pennsylvania Turnpike (in fact, the Turnpike passes within a quarter mile of our house, but the interchange is on the other side of

town). It's beautiful country—the Cumberland Valley is reputed to be some of the richest agricultural land in the country. We have lots of space in our house, and no children here to take advantage of it; our two boys are away at college (Jim at Duke, class of '71, Tom at Yale, class of '73). So we would be delighted to see you or any members of the class who pass by this way. A phone call to (717) 243-9675 will get you directions for reaching us, and you're welcome any time."—**A. L. Bruneau**, Class Secretary, Hurdman and Cranstoun, Penney & Co., 140 Broadway, New York, N.Y. 10005

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The first item for this new season is a note from '39 President **George Beesley** concerning the possibility of an interim get-together in the spring of 1971. George and Eleanor visited Orlando and Lillian de Aragon in Puerto Rico a few weeks ago, and checked on several resort hotel possibilities for us. . . . Following are several news items from Alumni Fund replies. . . . **Norman MacBeth** wrote that he has been chairman of the board of Kollmorgen Corporation since September of 1967. . . . **Gus M. Griffin** is president of the M.I.T. Club of Kentucky. Incidentally, according to the Alumni Register, Gus is also president of his own firm, the Griffin Chemical Company, of Louisville. . . . Professor **A. Richard Williams** wrote that he is retiring this summer from the University of Illinois and will enter the active practice of architecture and consultation in urban design. . . . **Leo A. Kiley** noted that he retired as brigadier general from the U.S. Air Force in August, 1969, with the Distinguished Service Medal. He is now general manager of the Neutron Devices Department of General Electric, in Florida. I don't know what this column will do without those frequent air force news releases about Leo's army career activities which we have followed for the past several years. . . . **Joseph F. Coffey** wrote that he received his Ph.D. in chemistry from St. Louis University on June 6, his 53rd birthday. He is still teaching at the Forest Park Community College in St. Louis. His thesis title was "Solvolysis of Halogen-Substituted Primary Alkyl Nosylates."

One of the 1970 freshman students admitted at M.I.T. is Miss Sondra R. Zemansky, daughter of Mr. and Mrs. **Stanley D. Zemansky**, '37 and '39 respectively. Our classmate is the former Anne A. Person, of Course IV. . . . And another freshman is Miss Mary Ellen F. Hynes, daughter of **Vincent M. Hynes**, a Special Student '39.

William S. Brewster was one of six alumni elected for five-year terms to the M.I.T. Corporation, in June. . . . **James S. Bruce** has been named director of Eastman Kodak Company's photographic technology division, in Rochester, N.Y.—**Oswald Stewart**, Secretary, 3395 Green Meadow Circle, Bethlehem, Pa. 18017

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The Rally, which substituted for the 30th reunion, was a success with a total of 46 people attending. Those present included John Vanderpoel, the Bob Bittenbenders, the Phil Stoddards, the James Gilmans, Ted and Edith Kingsbury, Charles and Eleanor DeMailly, the Martin Abkowitzs, the Don Erbs, the Frank Libmans, the Fred Hammesfahr, Jack Danforth, the Russ Hadens (at whose farm the Rally was held), Louis Michelson, Larry Jones, the Bill Sterns, the Hap Farrells, the Sam Goldbliths, the J. B. Feldmans, the Dag Eckhardt, the Jim Rumseys, the Sam Rabinowitzes, the Walter Helmreichs and the Dick Powers.

We were also represented at Alumni Day by Jack Danforth, Charles and Eleanor DeMailly, Jim and Mrs. Gilman, Milt Green, Fred and Mrs. Hammesfahr, Larry Jones, Ted and Edith Kingsbury, Fred and Mrs. Libman, Wesley and Mrs. Pendleton, Jim and Mrs. Rumsey, Phil Stoddard, Lou Tura, Ed and Mrs. Wallace. In connection with the Rally, I made the proposal that the money in our class treasury should be given to the Institute at the time of our 50th reunion. Jack Danforth, Bob Bittenbender and Phil Stoddard all agree that this makes sense. It would be a good idea to vote on this at our next meeting in 1975. At present the treasury stands at \$1,334.55.

Roger Mather advises that he is now assistant to the assistant director for Power, NASA Lewis Research Center, Cleveland, Ohio. . . . **Larry Jones** writes that his son, Stuart, starts the third year at Harvard Medical School this fall and his daughter, Merrell, her sophomore year at Kirkland College. Divorced almost two years ago, he hopes to announce being engaged shortly. . . . **Jeanne Pearlson Henry** notes that she is now professor of business administration at Federal City College in Washington, D.C., having moved to Washington last September when her husband (Warren E. Henry) accepted the position of professor of physics at Howard University; their daughter Eva, 11, will attend Sidwell Friends School. . . . **Bob Millar** advises that he is enjoying living and working in the "four seasons state" (Vermont) and raising four children, ages nine to twenty.

In changing positions, **Clem Burnap** advised his position as corporate vice president of marketing and engineering for Yuba Industries vanished with a change of presidents in February 1970; after several months' operation in consulting work, he joined PACECO (formerly Pacific Coast Engineering Co.), division of Fruehauf on June 1, 1970. He is working in the international division with initial responsibility for sales and licensing activity in Europe, Africa and the Middle East; PACECO manufactures container handling cranes—ship mounted, dock mounted and wheel mounted as well as small ships, dredges, barges, and so on.

Bob McKinley received the ASTM Award of Merit at the 1970 Annual Meeting. . . . **Bill Singleton** advises that in February he had completed two terms as president of Gulf-Southwest Chapter, American Institute of Planners and received a handsome citation in recognition of leadership of the chapter during his terms as president. . . . Among those changing jobs is **John Quady**, now program manager of the Advanced Marine Vehicle Systems Activity of the ROHR Corp., Chula Vista, Calif. . . . **Bill Stern** is now marketing manager of SETRA Systems, and will be responsible for sales and marketing of the company's transducers, signal condition instrumentation and some unique data retrieval systems.

The Rally resulted in several letters, including the following from **Greg Bry**: "Regret that I will be unable to attend the reunion on June 14. Count me in as one of those present in spirit!! We have been living in Philadelphia for the past two years where I have been in an upholstery weaving operation. It is a field with which I am familiar from past experience; we are enjoying life in these parts very much. I suppose I qualify as having the youngest child in the class; we were blessed with a new arrival, a daughter, two years ago. At my advanced state of decay I am finding that this makes for a very quiet life." . . . As well as **Ray Keyes'** letter which is as entertaining as his Christmas letters: "The thirty-year reunion of the Class of '40 sounds like an event I would love to attend. Myself and family remember the 25th with a good deal of pleasure. Regretably we shall have to forego the 30th. Since last we met, we have moved north from California to Washington State. I am a naval architect gone wrong. I am a systems or development engineer for a reactor design being done by Battelle Memorial Institute here in Richland. The whole product is about to be transferred to Westinghouse due to some new law on taxes on non-profit institutions doing government work. In addition to being an engineer I am now a rancher. We have 12 acres on the Yakima River. My herd numbers fifteen head with five of them being this year's calves. I have some registered polled Herefords. Part-time ranching is a substantial job in its own right. Every evening I feel compelled to accomplish some task—repair a fence, fix the mower, stop the leak in the irrigation main, fix the leak in the power take-off shaft of the tractor and so on and so on. When all those tasks are done, new ones present themselves. We have just completed mowing the first crop of hay. I am going to try to get my winter hay all from my own pastures this year. So far ranching has been a negative income enterprise. If I can manage to reduce my maintenance and repair expense, I might split even this year. Some advantages to this kind of life are the hunting and fishing opportunities for the boys. We had a number of pheasant, duck, quail dinners and one goose. The latter is a sharp-eyed bird and a hunter has to be skillful, patient and lucky to get one. I could write a lot more about our new way of life.

Needless to say the ranch ties us down. Also being so far away from Cambridge makes attending the reunion of '40 out of the question this year. Maybe it might be possible in 1975. It would be interesting to know if any '40 classmates have adopted the rural life. My fondest regards to the Class of '40 reunion. I shall look forward to a few words about it in the *Review*."

As a final note, as I expressed in my letter to **Jack Danforth** at the time of the Rally, if there is a volunteer to take over the job of Secretary-Treasurer, I would be glad to turn over the job.—**Alvin Guttag**, Secretary, Cushman, Darby & Cushman, 730 15th Street, N. W., Washington, D.C. 20005

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Class '41 members attending the M.I.T. 1970 Homecoming were Michael Driscoll, Edward and Mrs. Marden, Reid Weedon and Walter Kreske.

D. Reid Weedon was one of six people elected for a five-year term to the M.I.T. Corporation. This is Reid's second term, his first being from 1961 to 1967. Reid served as a lieutenant commander in the navy during World War II and has been associated with Arthur D. Little, Inc. since 1946. He became vice president in 1954 and senior vice president in 1962. He is president of the Museum of Science, trustee of the Technology Square Trust and a director of Phi Beta Epsilon and Winchester Hospital. He was a director of the Cambridge Chamber of Commerce from 1962 to 1965 and has been chairman of the Massachusetts Commission on Ocean Management since 1968. He was president of the Alumni Association for 1961-62, was chairman of the Alumni Fund Board from 1962 to 1965, has been a member of the Corporation Development Committee since 1965 and has been an active member of a number of other M.I.T. committees.

E. Kirkbride Miller has been promoted to the position of president and chief executive officer of Rowe Price Management Company, Inc., 1 Charles Center, Baltimore, Md., an investment advisory firm, a wholly owned subsidiary of T. Rowe Price and Associates, Inc. Kirk joined the parent firm in 1952. He is a native of Baltimore and a graduate of Baltimore Polytechnic. Besides his B.S. degree from M.I.T., he holds an M.B.A. degree from the Harvard Business School. . . . **Howard J. Samuels** has been appointed a special counselor and troubleshooter to Mayor Lindsay of New York City. Howie's first assignment is that of serving as chairman of the city's new Off-Track Betting Corporation which was created in the last session of the N.Y. State legislature. He was formerly Undersecretary of Commerce in the administration of President Lyndon B. Johnson, after which he ran for the Democratic nomination for Governor of New York but was defeated last June by Arthur J. Goldberg in a close primary election.

Joseph G. Gavin, Jr., is the author of an article "The Orbiting Astronomical Observatory" published in the *T.R.W. Space Log*, Vol. 9, No. 4. The article discusses the Orbiting Astronomical Observatory (OAO-2) launched on December 7, 1968 which continues into its second year of successful operation in its orbit 479 miles above the earth. Joe is senior vice-president, space programs, Grumman Aerospace Corporation, Bethpage, N.Y. After service as an engineering officer with the U.S. Navy during World War II, he joined Grumman as a design engineer. He subsequently was assigned as project engineer on the F9F-6 in 1950 and on the F11F program in 1952. In 1956 he was appointed chief experimental project engineer. In 1957 he was made chief missile and space engineer, and in 1962 was promoted to vice-president, director of the Apollo Lunar Module program. In 1968 he was named senior vice president with responsibility for all Grumman space programs. He is a member of the American Institute of Aeronautics and Astronautics, and in 1968 received the man-of-the-year award from the Aerospace Educational Council, Inc.

Robert Sinsheimer is the author of the introduction to a special issue of *Engineering and Science* magazine devoted to representative selections from a conference on the "Biological Bases of Human Behavior" held at Caltech on March 16-18, 1970. . . . **Frank S. Wyle** has been elected chairman of the board of directors of Wyle Laboratories, El Segundo, Calif., and continues as chief executive officer of the company.

James S. Cullison delivered a paper on "Measurement of Work Effectiveness" at a meeting of the Japan Management Association in Tokyo, Japan, last May. Jim is president of the Los Angeles Chapter of the National Management Association. Also, he holds the rank of colonel in the Corps of Engineers Reserve and is an instructor in the Industrial College of Armed Forces where he teaches the course "National Security Management." He is associated with the Los Angeles Division of North American Rockwell Corporation.

Ralph B. Delano reports that since August, 1969 he has been a "fellow" at the M.I.T. Center of Advanced Engineering Education studying computer simulation, management decision theory and related subject matter. During this period, he has been living in Marblehead with his wife and two children, Deborah and Geoffrey, and has returned to Cold Spring, N.Y., as of June 20. . . . **William N. Price** says that he has gradually moved from engineering into the humanities. To this end, he has completed studies for a master's degree in public administration at American University, and is now a personnel specialist and a division director in the navy's office of civilian manpower management. . . . **Calvin D. MacCracken** won the 1970 National Senior Squash Championship, thus adding to his former National Veterans' and National Men's Doubles Squash

titles. Also, he reports that he was issued patent No. 3,495,415 last February for a new type skating rink which freezes by stratified cold air. He is now manufacturing, selling and installing them nationally at big cost reductions over conventional rinks. This is his 80th patent!

I. Harry Mandil reports that he left the Atomic Energy Commission in 1964 and established the engineering firm of MPR Associates, Inc., Washington, D. C., specializing in nuclear power generation, marine engineering and associated fields. Harry has been a principal officer and director of the firm since 1964.—**Walter J. Kreske**, Secretary, 53 State St., Boston, Mass. 02109; **Everett R. Ackerson**, Assistant Secretary, 831 Cranford Ave., Westfield, N.J.; **Michael Driscoll**, Assistant Secretary, 63 Center St., Nantucket, Mass.

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Fred Sargent, 2nd has been appointed provost of Western Washington State College in Bellingham, Wash., effective August 1. The position of provost is a new one at Western Washington State and Fred will be the second-ranking officer of the college. He is moving to Bellingham from his post of Dean of the College of Environmental Science at the University of Wisconsin in Green Bay.

Several copies of the *Business Week* article on **Jack Flipse's** Deepsea Ventures were sent in by classmates. Deepsea Ventures, Inc. is a subsidiary of Tenneco. The current program is undersea mining of manganese ore at 3,000-foot depths off Florida. This is the first trial for Deepsea Ventures' technology which could make deepsea mining commercial business by 1975.

Chuck Raynsford has been promoted to the position of director of engineering at the Electrical Components Division of the Bendix Company at Sidney, N. Y. . . .

John Haas was promoted to executive vice president and vice chairman of the board of Rohm & Haas Company. . . . A note from **Ed Edmunds** reports that he merged his company, Edmunds Chemical, with four other small chemical companies to form S.E.C. Corporation, a chemical manufacturing and distributing company. Ed's primary products are CO₂, dry ice, and chlorine. Ed moved his headquarters from Albuquerque to El Paso and says that everybody is getting real fluent in Spanish. Ed's oldest girl is with T.W.A. as a stewardess. He has one boy at Colorado College and one at Stanford. His twin girls are juniors in high school.

Bernie Levere's son, David, was named a Presidential Scholar—one of 119 graduating high school seniors in the United States. Bernie and Zelda were at the White House when he received his award. David was also a Yale National Scholar but plans to attend Harvard in the fall. Bernie is warning all classmates in the Boston area to be aware of David's

appetite! . . . **Harvey Kram's** daughter, Kathy, Course XV, Class of '72, is marrying David Dobkin, Class of '70. Harvey is already scheduling his first grandchild, Nicole, for the Class of '92! . . . **Stuart Dunham** has left G.E. and is a senior analyst with Environment/One Corporation in Schenectady. . . . The freshman class entering in September, 1970, includes **Jack Sheetz's** son John, and **Herbert Harris's** daughter Linda. . . . Hope everybody had a happy and healthy summer. Let's hear from you.—**L. K. Rosett**, Secretary, 191 Albemarle Rd., White Plains, N.Y. 10605

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We received notice of a new company, called Kencomp, Inc., which has been established in Lexington, Mass. as a subsidiary of Thomas K. Dyer, Inc., consulting engineers. Classmate **Tom Dyer** wrote that this new firm supplies computer software services to the transportation industry, such as railroad transportation design. The three oldest of Tom's five daughters are in college this year at Jackson, Smith and Trinity. . . . Miss Judith Fallows will be the first class daughter to enter M.I.T., which should make **Dick Fallows** quite proud this year.

Henry Brown, Jr., has started his own business in Newport Beach, Calif., on electronic circuit consulting and manufacture. He was with North American Rockwell in electronic computers for 20 years. . . . **Mort Goodfriend** left Gilman Paper Company, where he was director of marketing, and joined the corporate staff of International Telephone and Telegraph Co., in New York City, as manager of marketing research with cognizance over the worldwide operations of I.T. & T. . . . **Iz Lenzner** writes that he enjoys reading the class notes and that his golf is as bad as ever. . . . From the Philippines came word via **George Potts** that he is still with Esso Philippines, and that there is now an M.I.T. Alumni Club in Manila, under the guidance of Cesar Concio, '40.

John Guarrera, of Northridge, Calif., president of Guide Scientific Industries, Inc., was elected as the delegate of I.E.E.E. Region 6. . . . **Jim McDonough**,

along with Professor Gordon Brown and Bill Pease, '42, received the Numerical Control Society's Jacquard Award for pioneering work in developing the first practical numerical control system.

Leo Feuer was elected president of The Wm. Carter Co. in Needham Heights, Mass., with whom he has been since 1947. . . . "**Honest Dick**" **Feingold** was nominated as the Republican candidate for State Representative from the Twelfth Assembly District in Connecticut, and has stated that he is as strong as a bull-moose and running hard. He promises a full dinner pail for all, and two cars in every garage. (Is that pollution control?) —**Richard M. Feingold**, Secretary, 266 Pearl St., Hartford, Conn. 06103; **A. J. Kelly, Jr.**, Associate Secretary, 34 Scudder Rd., Westfield, N.J. 07090

44

Your Secretary **Jack Barmby** asked me to handle the class notes again due to the press of time. To quote his note, "I'm frantic with a big proposal at work and term papers at school." Fortunately, the class seems to have sent in a good deal of information, so I have a rather complete set of notes to work from.

We received a note that **William Bommer**, Vice President of Acushnet Company of New Bedford—golf division, has been elected an executive vice president of the parent company. He lives in South Dartmouth, Mass. . . . To illustrate the extent to which the press is combed for names of M.I.T. men in the news, we received a clipping from a recent *New York Times* which listed recent patents, and it includes the description of a patent granted to **William C. Cooley** for a water cannon for breaking rocks and concrete, tunneling and other heavy tasks. The unit is capable of producing pulsed jets of water with pressures up to a million pounds to the square inch. The article states that Bill's firm Exotech has entered a joint venture with the Calweld Division of Smith International in Los Angeles. . . . **Bud West** dropped a note along with his Alumni Fund contribution, and I quote: "Fulfilling Institute obligations this year as: Educational Counselor, President M.I.T. Club

of Virginia Peninsula, Alumni Advisory Council, Chairman Regional Alumni Fund."

A note from Dr. **Andrew Margileth** indicates that as of July 1 he has been promoted from associate professor of pediatrics to full professor at George Washington Medical School in Washington, D.C.

A note from **Arturo Morales Dominguez** from Mexico City advises he is doing design and consulting work mainly in the mining field but keeping his hand in the aeronautic field. . . . **Bob Horrigan** says that he has found out that running one's own business can be great fun—after the early years, that is. His company, Transelco, manufactures raw materials for the electronic and optical industries and last year exceeded the million mark in sales. On one of his business trips he recently contacted **Ed Bielecki**. . . . **Jim Garrison** reports that he is presently coordinator, Fluid Dynamics and Diffusion Laboratory, Colorado State University, Ft. Collins, Colo. While on the subject of notes sent in with alumni fund contributions, I believe this is an excellent way to get news to the Class Secretary.

My note to Jack Barmby was, "it was pleasant to do the notes for last month. However I find that I am really out of practice and it took a good deal longer than it used to. Have just completed two years as president of Fairfield Alumni Club, and am now an advisor as ex president."

Included in the news received during the summer is the list of class members who attended the Homecoming last June. They are: John C. Conroy and Mrs. Conroy, Arthur Gray, Jay and Tink Martin, Peter Matthews, Joseph J. and Mrs. Snyder, and Alfred Picardi.

A very complete news release was received on **Justin Margolskee** who has been named general manager of Raytheon Company's missile systems division. Justin, a vice president of Raytheon, has been assistant general manager-operations of the division since early this year. Justin has been with Raytheon since 1947, and presently re-

sides in Lexington, Mass. . . . Another release announces that the board of directors of Cambridge Technology, Inc. has appointed **Robert D. Peck** as president and chief executive officer of the company. Cambridge Technology, Inc. specializes in the field of environmental pollution control and manufactures products for that field. Previous to being appointed president, Bob was executive vice president of the American Association for Contamination and Control.

I received a couple of address changes, and they indicate that **Bill Van Ravenswaay** has returned from Madrid, Spain where he was erecting a refinery for Caltex, and is now living in Larchmont, N.Y. . . . Another address change indicated that **Bill Ritchie** had moved to Woodland Drive in Amherst, N.H. I called Bill, and he says that he has started his own consulting business, as of three months ago. He is specializing in general management and manufacturing problems. He had been with Mechanical Technology Inc., of Latham, N.Y., as director of manufacturing. Bill says that once he had his youngest daughter out of college he could think seriously about setting out with his own company.

It has been fun putting together the notes this month, because as you can see, a number of the class members have sent in news. I hope that you will continue to do so for your full-time Secretary, **Jack Barmby**, 924 Fairway Dr., N.E., Vienna, Va. 22180—**Paul Heilman**, Acting Secretary, 30 Ellery Lane, Westport, Conn. 06880

45

Your 25th reunion has come and gone but the memories of this festive occasion will endure. During the next several issues of the *Review* I shall attempt—if my memory permits—to commit my thoughts to writing.

In capsule form the Class's 25th reunion held on the M.I.T. Campus June 12-15 was attended by 64 alumni, 48 wives and 77 children—a total of 189. As Reunion Chairman **Tom McNamara** has reported

to the Association the location and food were good while the management and service were excellent.

At a duly constituted class meeting, the following slate of officers submitted by the Nominating Committee, consisting of Dave Trageser, Tom Stephenson and Tom Hewson, was unanimously elected: President—Tom McNamara; Regional Vice Presidents: Northeast—Bill Shuman; Middle Atlantic—Ed Stoltz; Southeast—Guy Gilleland; Midwest—Nick Mumford; Southwest—Jake Freiburger; West Coast—Bob Hildebrand; Pacific—Sherry Ing; Vice President, Finance—Max Ruehrmund; Treasurer—Bill Meade; Class Agent—Bob Maglathlin; Secretary—Clint Springer.

You will note that those assembled in the hallowed halls have displayed great wisdom—especially as respects the quantity and quality of vice presidents. Seven regional vice presidents will cause, if nothing else, involvement while the election of Maxie Ruehrmund is in reality long overdue recognition for his chore as 25-Year Gift Chairman. Despite the recession and all the other excuses that come to mind Max did an excellent job these past five years as evidenced by the \$120,426. collected from approximately 250 classmates.

Putting the reunion aside for the moment, allow me to report the news items that have accumulated over the summer.

David R. Clare was elected president of Johnson & Johnson Domestic Operating Company in mid-May; no wonder Dave and Peggy could not make the reunion! Dave has been executive vice president & general manager of Johnson & Johnson's Hospital & Professional Division since 1968. For five years prior to that he had served as executive vice president of operations. Dave joined J&J in 1946 as a trainee and held various engineering positions before hitting his first manager's job in 1955. . . . As of September 1, **David Mintzer** has been appointed associate dean for research and graduate study in the Technological Institute of Northwestern University. . . . **Steve Wellington** advises that he is a systems analyst with the First National Bank of Boston.

The following reunion telegram ad-

dressed to **Tom Hewson** was mailed to **Guy Gilleland** who in turn passed it on to me: "Our very best wishes for a great reunion to all the gang, sorry we cannot be with you this year. If Strnad (J.J. and Edna were not present) still begrudges me thesis credit he can jump in Lake Erie; also suggest further definition of position by Guy Gilleland of Director of Fruit Operation (!). Best to All." Signed **Jeanne** and **Bill Martin**. Guy advises that his directorship was far too strenuous which caused him to leave Minute Maid and establish his own consulting business—no fruit.

Vince Butler's mother-in-law, Elizabeth Charleston, had an excellent show at the Hammer Galleries in New York in mid-May. I'm no art expert but I thoroughly enjoyed the show! Vince has mailed me a copy of our old V-12 Regulations which will be quoted from time to time in the months ahead. My children thoroughly enjoyed them to the degree that the Regulations are regularly thrown at me whenever I or they err! . . . **Jay W. Forrester** continues to receive world-wide recognition. In January the National Academy of Engineering reported that Jay was awarded the Valdemar Poulsen Commemorative Medal by Denmark's technical university for his work in perfecting the memory of digital computers. The March-April 1970 issue of *Think*, an IBM publication, contained a most interesting article titled "Inventor. Engineer. Heretic. Jay Forrester." Space does not permit too much comment but you will all enjoy a quotation from Dean Gordon Brown: "Ever since he arrived at my lab as a grad student, he has deliberately kept himself in the background. He emerges to stick up for his ideas—but in a strictly impersonal way."

Jack B. Skinner's oldest son, Charles B., has finished a year of graduate work in history at Harvard. . . . **H. Carlton Howard** continues as chief of ophthalmology at Mercy Hospital with his chief outside interests listed as five kids, 7-15, with a little tennis and boating. . . . **Alvin S. Cohen's** son Mark and **Dave Hu's** daughter Esther are members of the Class of 1974 and we suspect that **Bob Maglathlin's** oldest son Clark should also be on the list. Bob, our new Class Agent, should be formally congratulated (if

that's the word) on the excellent reunion booklet put forth by his committee. As you might expect, there are just a few—and I dare not ask the specific number—books available. This soft-covered booklet was mailed in early June to all those classmates that forwarded class dues during the spring; the rest of you can obtain a copy by writing directly to me for details. Yes we can use your money and you will thoroughly enjoy the book. Happy Election Day.—**C. H. Springer**, Secretary, c/o MFB Mutual Insurance Company, 420 Lexington Ave., New York, N.Y. 10017

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I hope all of you had a pleasant and enjoyable summer. We were able to vacation for two weeks at Williamsburg, Va., and Nagshead on the outer banks of North Carolina. This area of North Carolina is very unspoiled and quite un-commercial. Except for the fact most cottages are built on pilings, the area appears like the north cape of Cape Cod.

Frank J. Blatt has sent us a very fine letter from his office at Michigan State University. Frank returned to M.I.T. soon after he received his bachelor's degree in electrical engineering in 1946. Further studies produced the award of a master's degree in E.E. in 1948. Frank accepted a position on the faculty of the electrical engineering department of the University of Washington in Seattle. After teaching two years in that department, Frank transferred to physics and was awarded a doctorate in 1953. During the years 1953 through 1956, Frank held positions as research associate and research assistant professor at the University of Illinois. It was in 1956 that Frank joined the physics faculty at Michigan State University as assistant professor. Promotion followed to associate professor in 1958, and professor in 1961. Since the fall of 1969 Frank has been chairman of the physics department at M.S.U. During these past years Frank has served as consultant to the Naval Research Laboratory, duPont and the Argonne National Laboratory. He is presently chairman of the Solid State Science Review Committee for the Argonne National Laboratory. Foreign studies and travel were an important part of Frank's life. He was at the Clarendon Laboratory in Oxford during the academic year 1959-60, and he spent the year 1963-64 at the E.T.H. in Zurich as visiting professor. Frank was married in 1946 and he and his wife have two children, a boy, 17, and a girl, 8.

Bill McEwan's recent letter was also very complete, and we appreciate receiving letters like this very much. Bill, his wife, Charlotte, three boys aged 19, 15 and 13, and a girl aged 17 live in Annandale, N.J., where they enjoy relatively open country. The oldest boy is attending the University of Colorado and their daughter has just graduated from high school. She will attend Queen's

University at Kingston, Ont. Bill's professional life has been with International Telephone and Telegraph. For many years he served as director for the research development laboratory of the Electron Tube Division. In 1965 he left purely technical activities for the marketing department. Since 1967 Bill has been director of marketing for the Electron Tube Division. The main plant is at Easton, Pa. Bill's home in Annandale, N.J. is located 20 miles from Easton but is a convenient location to the Newark airport, for travel is an important segment of his marketing position.

Harvey S. Freeman heads the Independent Engineering Co. in Madison Heights, a suburb of Detroit, Mich. His engineering and manufacturing company builds special machinery and has just recently been moved to their new building. Harvey and his wife have three children, 18, 16 and 14. . . . **John L. Norton** has written from his home in Cincinnati, Ohio. John has been with General Electric for several years. During the seven years, 1962 through 1969, he was at Cape Kennedy as base manager for G.E. flight test operations. During this time they made 76 rocket launches. A year ago the Nortons, John and Priscilla, moved to Cincinnati where John is with the General Electric Aircraft and Engine Group. John and another classmate, **Guy Wooten**, are on a team fighting for the F101 engine for the B1 bomber. The Nortons' daughter, Linda, graduated from the University of Florida, and their son, John, has completed his second year at Yale. . . . The **Alan Eagle** family has recently travelled to Tahiti for a two-week scuba diving vacation. Besides being fans of scuba diving, the family spends its leisure time skiing and sailing. Alan, his wife and three children live in Los Altos Hills, Calif., and are, therefore, near areas for these sports activities. Alan is managing the management information systems at FMC Corporation which is headquartered in San Jose, Calif. This includes corporate-wide responsibility for operations, research, systems development, data processing operations and communications systems.

Bill Cahill has written and enclosed a catalog of his company, Wilshire Lighting Co. of Los Angeles. The company manufactures and assembles dining room and other chandelier type lighting fixtures. I have built two homes in the past 20 years and so my wife and I have looked at many lighting fixtures before we chose the fixtures we did. I can, therefore, say on some authority that Bill's fixtures are really exceptional. I never recall seeing as many fine and beautiful fixtures as they display. If any of you are in the process of building a house we would encourage you to write Bill for details.

The Cahill family continues to grow and appears ready to take over the whole sports area. The oldest son is trying to make the national ski team at Steamboat Springs, Colo. The second son has a wrestling scholarship at Pierce Junior

College. The third son is football captain elect in high school, and the fourth son is freshman athlete of the year at Beverly Hills High School. The fifth son is leading the league in his little league baseball. Whew!! What a family!

Manuel R. Liaguno is general director of Nylon de Mexico, S.A. in Monterrey. He joined the firm when it was organized 12 years ago. Manuel is also a director of a textile firm, Leona Textil, S.A. which produces blended fabrics. It was this company that Manuel first joined after returning from M.I.T. The Liaguno family has grown to 9 children. Manuel, this is close to the class record which, I believe, is held by the William Cahills and the Russell Dostals, each with 10.

After graduation from M.I.T. in 1946, **Alex Halberstadt** joined a Boston firm of engineering consultants. Work in Akron, Ohio provided an opportunity for another very good job offer which kept him in Akron. Until 1966 the Halberstadts were at home in Akron, which is company headquarters, and where all six of their children were born. The Halberstadt children are Robert, 24, Caryl, 23, Cheri, 21, Chuck, 19, Rickie, 17 and Susan, 11.

The Halberstadts are now living in St. Petersburg, Fla., where Alex is project manager for Associated Biscayne Companies, engaged in the construction of the St. Petersburg Hilton Hotel. Previously Alex worked on the Jacksonville Sheraton and the Key Biscayne Sonesta Beach Hotel. Other irons in the fire for Alex and his company are the Pasadena Hilton, the Akron Hilton Inn West, an airport motel being constructed in Detroit and work on the initial design for an addition to the Lucayan Beach Hotel in the Bahamas. Alex is documenting and photographing the construction of the St. Petersburg Hilton and expects it to be quite a construction story. The hotel is being constructed in such a novel way that he feels it will be of great interest to the construction industry. Alex spends his leisure time writing, flying, scuba diving, taking underwater photographs, playing golf, and bridge with friends.—**Russ Dostal**, Secretary, 18837 Palm Circle, Cleveland, Ohio 44126

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The sign-up list for Homecoming 1970 reminds me that I have not yet obtained a list of '49ers who attended the very enjoyable cocktail party arranged by Joe Schneider in the penthouse of McCormick Hall, overlooking the Charles; that was on Sunday evening. Those who registered for Homecoming were: Mr. and Mrs. Jack Barriger, Andy Bigus, Mr. and Mrs. Fletcher Eaton, Mr. and Mrs. Harold G. Green and guests, Mr. and Mrs. Jabez S. Harford and guests, Mr. and Mrs. Alden Loud, Stanley Margolin, Mr. and Mrs. Len Newton, and Paul E. Weamer. . . . A dozen class notes arrived via Alumni Fund envelopes—

a very simple and effective way to get in touch with your classmates. As usual, these notes take priority in the column.

Commander **Linsey S. Ashley** reports that his daughter, Lucy, married Steven C. Miscaen, a fourth year N.R.O.T.C. man at West Virginia University, last December. . . . **Francis M. Bator** is currently professor of political economy at Harvard and director of studies in the Institute of Politics; from 1965 through 1967 he was deputy special assistant to the President for national security affairs, responsible for European affairs and foreign economic policy at the White House; he was elected a Fellow of the American Academy of Arts and Sciences in May, 1970.

George P. Jacobson reports, "After 12 years with Allied Chemical changed to self-appointed president of Midcontinent Marine, Inc., St. Louis, Mo., hoping to successfully combine inland and ocean/marine transportation."

Carl A. Lindstrom reports that he is a research and development group leader for Electronized Chemicals Corp., in Burlington, Mass. He lives in Arlington, has two teen-age boys and owns "a whole island retreat on Lake Winnepesaukee!" . . . **Austin F. Marx** reports that he is the newly appointed director, corporate planning and development, for Hewlett-Packard Co., electronic instrument manufacturer in Palo Alto. He is currently president, Corporate Planners Association and past president of the Peninsula Marketing Association. He is active in Stanford Campus Ministry, Wescon, sailing, and swimming.

Ross E. McKinney was president of the Kansas Section of the American Society of Civil Engineers for 1969. He has established a new company, Environmental Pollution Control Services, Inc., to assist in evaluating technical information in the pollution control field. . . . By way of a rubber stamp, **W. Norris McSweeney** reports himself as president-treasurer of The Normac Company, Inc. . . . **George F. Motzenbecker** reports from Detroit, "Just purchased my own business. Broke but having fun getting organized."

Barbara (Feeney) Powers comments on M.I.T. 1970: "We are happy with the opportunities and experiences provided for our son Stephen, '74, in the U.S.S.P. program this year at M.I.T. We appreciate the news from the Institute and are pleased to see its leadership towards progress and educational change."

Frederick W. Reusswig reports himself as pleased to be a member of M.I.T. Educational Council. He has a new job as assistant head of the Operations Division at Stanley Consultants. Under family news he reports that his son, Mike, is married, is in the U.S.A.A.F., and hatched a granddaughter, Amy, in February. Two other sons, Pat and Dave, are in college. A daughter, Cathy, enters high school this year. . . . **L. P. (Rick) Richardson** says that he is the new manager, Western region, for the

Lubrizol Corporation. Last October he was elected to the national board of directors for the Society of Automotive Engineers. . . . **William F. Wicks**, Captain, U.S. Navy, reports that his present job involves technical management of development of new underwater acoustic sensors for ships of the U.S. Navy and their life-cycle logistic support.

A. Scheffer Lang was very much involved in the July, 1970, Boston-held National Transportation Engineering Meeting, "New Concepts in Transportation." He presided at a session dealing with innovative transportation prototypes and was in a panel discussion of educating engineers in transportation. . . . Another Lang, **Harry J. Lang** (and Associates), has been appointed distributor-sales representative to the state of Alaska for Electro-Voice, Inc. Harry now has had 20 years experience in the electronics and instrumentation field, and his offices are in Anchorage, Alaska.

We reported in the last issue that **Leonard F. Newton** had been appointed vice president of Response Analysis Corp. of Princeton, N.J. A publicity release adds details as follows: "A specialist on consumer attitudes towards financial services and institutions, Newton was formerly a vice president and director of Opinion Research Corp., Princeton. In his career he has contributed to the development of motivation, marketing and image research techniques to solve problems in the fields of banking, insurance, utilities and drugs. A graduate of M.I.T. with a degree in industrial management, he was recently elected to the board of directors of the M.I.T. Alumni Association. He is a director of the advisory board of the Franklin State Bank, chairman of the board of the Mercer County Community Action Council, a member of the editorial advisory board of *Technology Review*, and an elder of the Witherspoon Presbyterian Church. Drawing on his years of experience in researching and reporting all types of customer and public opinion, he is a frequent lecturer before business groups. He and his wife, Ruby, have four children and live at 90 Dempsey Avenue, Princeton."

Finally, more signs of times passing by: the 1970 list of admitted freshman students includes Robert N. Lambe, son of **Harry W. Lambe**, and Emily C. MacFarland, daughter of **Howard T. MacFarland**. Congratulations to both new students and their parents. . . . Best wishes until next month.—**Frank T. Hulswit**, Secretary, 77 Temple Rd., Concord, Mass. 01742

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Joseph D. D'Annunzio, President of D'Annunzio Bros., Inc., Contractors & Engineers, has been appointed as a member of the United States delegation to the OECD Advisory Conference on Tunnelling. This conference is regarded by OECD as an experiment in international cooperation to demonstrate the

feasibility of using the combined knowledge and expertise of many countries to arrive at sounder, more balanced judgments about the technological policy. As such, it represents a fresh approach to the role of technology in international planning. . . . **David E. Gushee** has been appointed to the newly created position of assistant to the executive director of the American Chemical Society. Mr. Gushee was formerly publication manager of the Society's scientific journals. A native of Milton, he now lives in Vienna, Va. He served in the U.S. Army Chemical Corps in Korea and was employed by the duPont Company for five years. He joined the A.C.S. staff in Washington as assistant editor of *Chemical and Engineering News* in 1956, moved to the San Francisco news bureau in 1957, returned to Washington in 1959, and became head of the London bureau in December, 1960. After opening the Frankfurt, West Germany, office late in 1961, Mr. Gushee returned to Washington in mid-1962 to become managing editor and, late in 1963, editor of *Industrial and Engineering Chemistry*. He became assistant director of circulation development in 1965-66, and in 1967 was appointed publication manager, journals, for all A.C.S. primary journals except *Chemical and Engineering News*.

James R. Cass, Jr., Port Engineer for Mass. Port Authority, spoke at the American Society of Civil Engineers' national transportation engineering meeting in July at the Statler Hilton Hotel in Boston, on the subject of "Construction" regarding the Boston-Mystic Public Container Terminal. . . . **Royden S. Bair** has been elected director for Texas and Oklahoma, on the National Board of the Construction Specifications Institute for three years, starting July, 1970. . . . **Hubert L. Barnes** has a new title, Professor of Geochemistry and Director, Ore Deposits Research Section of Pennsylvania State University and member of the board of directors of Scientific Systems, Inc.—manufacturer of high-pressure equipment.

Lawrence Sirkis has lived in Sharon for 15 years with wife Anne and three children—Linda, 18 years, Stephen, 16, and Allen, 13. Daughter Linda will enter Simmons College in the fall. She hopes to study special education there. . . . Since September of 1969, **Charles A. Church** has been vice president and chief operating officer of Automatic Drilling Machines, Inc. He was recently elected to the board of directors. . . . Lieutenant Colonel **Robert C. Geiss** will retire from the Air Force in 1971. . . . **Fred Kurzweil, Jr.** sends his best regards to fellow classmates. Received his Ph.D. in electrical engineering from Stanford in 1960 and has been employed by I.B.M. ever since. At present he is in charge of an advanced development group in the magnetic disk file area of computer systems. Lives with his wife, Virginia, and son, Lee, in Saratoga, Calif. . . . **Robert C. Stout** is presently assistant superintendent at Bethlehem Steel Corporation's Hot Strip Mills, Sparrows Point, Md.; committee chairman, Association of Iron

& Steel Engineers, Baltimore section. His son, Peter, is attending Middlesex School, Concord, Mass., and his daughter, Susan, is attending St. Paul's School in Baltimore. His wife, Bobbie, is a 1969 graduate of Goucher College and working as an assistant at Maryland Academy of Sciences.

Joseph S. Gottlieb is now president of Allison Developers, Inc., and has been active in real estate and construction. He reports that he maintains his interest in environmental engineering by continuing his consulting practice in air pollution control. To sustain their on-going love affair with the Caribbean Isles, Joe and Vera are planning to visit Barbados and Guadeloupe this summer, while Jane, 16 and Bob, 12, pursue work and camping activities respectively. . . . **Bernard F. Burke** was elected a member of the National Academy of Sciences, 1970; and Fellow of the American Academy of Arts & Sciences, 1970. . . . **Edward S. Cohen** is enjoying his new assignment as director with Esso Standard, Thailand. Jon, 8, Amy, 6 and Andrew, 3, are becoming quite fond of Bangkok and are beginning to speak Thai. Rhea, his wife, tells us that Ed will also give guest lectures at Chulalongkorn University in his spare (?) time. . . . Captain **Edward F. Gallagher** is being transferred from Naval Base Los Angeles—Long Beach to U.S. Forces, Japan Headquarters as assistant chief of staff, located at Fuchu, Japan, effective June 30, 1970. . . . **John A. Moreland, Jr.**, has been appointed director of economic development for the Franklin County Regional Planning and Development Commission. He married the former Janet Price of Teaneck, N.J. They have three children: John A. Moreland, 3rd, 20 and a junior at U.V.M.; Peter Scott Moreland, 19, a sophomore at Williams College; and Nancy A. Moreland, a sophomore at Rice Memorial High School.

Among the 1970 admitted freshmen students at M.I.T. who are related to alumni are the following: Mark S. Daskin of Merian Station, Pennsylvania, whose mother is Mrs. **Betty F. Daskin**; and Peter W. Krag of Lexington, Mass., whose father is Dr. **William E. Krag**. . . . **Alan G. Bates** has been named department director of a new pollution control venture

department to develop worldwide business opportunities in industrial and municipal pollution control at Atlas Chemical Industries in Wilmington, Del. As director, he will manage all department operations. He joined Atlas in 1956 as an economic evaluation engineer. Since 1966 he has been manager of venture appraisal, which included assignments in new product and market evaluation. . . . **Robert C. O'Neill, Ph.D.**, has been named executive vice president of Cooper Laboratories, Inc. in Bedford Hills, N.Y. Dr. O'Neill joined Cooper Laboratories in March, 1961, as vice president and director of research and was elected a director of the company the following year. Prior to joining Cooper Laboratories, Dr. O'Neill was associated with Merck & Co., Inc. He is the holder of over twenty patents and has authored a number of scientific publications. He lives in Newark, N.J., with his wife, Agnes. Dr. O'Neill's office is located in Bedford Hills, N.Y.

Donald E. McGuire, manager of Corning's plant in Bluffton, Ind., since that plant opened in 1964, is being transferred to Corning as division manager of engineering. He joined Corning in 1955 and subsequently served in several engineering positions. He was named factory superintendent at Paden City, W. Va., in 1959, production superintendent at Martinsburg, W. Va., in 1962 and Bluffton plant manager in 1964. . . . The rector of St. Paul's School in Concord, N.H. has announced the appointment of **Walter L. Hill** of Lincoln, Mass., to the position of vice rector of the school, effective in September of 1970. Mr. Hill is the principal in the firm of Hill and Associates, Cambridge, Mass., a lecturer on education and urban planning, Harvard Graduate School of Education, and he is also the principal in the firm of Hill, Miller, Friedlaender, and Hollander, Inc., and a registered architect. He is married and has two children. He has served on the board of the Cambridge School, the Charles River Academy, and was a trustee of the Boston Society of Arts and Crafts. The Hills will move to St. Paul's in late August. . . . **Richard E. Merrifield** is directing du Pont's study on the fission and fusion of excitons. . . . **Eli I. Goodman** has recently been appointed to represent the Atomic Energy Commission in

Tokyo. He leads a group that will be responsible for the nuclear power forecast used by the Commission. Prior to joining the A.E.C. Mr. Goodman had diverse experience in nuclear energy at Westinghouse Electric Corp. (1959-1965), Nuclear Science and Engineering Corp. (1955-1959) and Brookhaven National Laboratory (1951-1954). He has authored numerous publications from 1954 to the present time covering the major aspects of this work.—**John T. McKenna, Jr.**, 2 Francis Kelly Rd., Bedford, Mass. 01730

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The last issue of the 1969-70 *Technology Review* has just arrived, we are in the midst of the first real heat wave of the summer, and class secretaries all over the world are concerning themselves with the October/November issue of the class notes!! Right now, I could use some of the cool fall weather that will prevail as you read this.

News—I guess that is what we're really here for, so . . . **Ralph Binney** was recently promoted to manager, U.S. export sales and services for the Foxboro Company, Foxboro, Mass. . . . Barbara and **Bill Carmack** have moved to Marshalltown, Iowa. Bill left Monsanto in St. Louis to join Fisher Controls, Inc.

Russell Casella received a Ph.D. in physics (University of Illinois), after graduating from Tech and has since worked in a wide area of theoretical physics at IBM and the National Bureau of Standards. He is currently in the theory section of the Center for Radiation Research at N.B.S. His field is particle physics. The March issue of *The Physics Teacher* carried an article by Russ on "Time Reversal Symmetry."

Ralph Evans, "single but still hoping" [sic], is presently at the R.C.A. Springfield, Va., facility. Ralph has had a number of different assignments with R.C.A. Service Co.; they have moved him around quite a bit, but he says that he is still able to keep up with his hiking and skiing. Ralph's field is communications, and he is a helluva good communicator with the Class Secretary—I wish more of you were.

As one reads other class notes, talks with other secretaries, even goes so far as to participate in a seminar for class secretaries, one can't help but note the recurrent theme—the constant sobbing, pleading, etc., as we here try to get a little information to fill out nine columns a year. How about sending us your Christmas newsletters (for those of you that send them), or even a note on a card: postal, greeting, or ?. It would really help.

Under the headline "Rejuvenation at Van Keuren's" (which was right under the bolder headline "Help Wanted") we learned that **Fred Ezekiel** was elected executive vice president of that company to reorganize it and channel its efforts more effectively. Van Keuren manufactures precision gauges and standards and precision tooling. The company, located in Watertown, Mass., includes among its products the device that determines the size of the holes in macaroni! . . . **Charles J. Henry** teaches languages at St. Stanislaus High School in Bay St. Louis, Miss. Charles is associated with the St. Augustine Seminary in Bay St. Louis.

Kenneth Kruger is a partner in Kruger, Kruger, Albenberg, Architects with offices in Boston (Long Wharf), and Newark, New Jersey. Ken is in charge of the Boston office, lives in Cambridge, is single, and judging by his date when we ran into him at a recent dinner party, allows his architectural good taste to influence his choice of dinner companions. . . . **Myron Lecar** is still studying the evolution of galaxies. His note stated that he was having fun with computers, found that he could teach freshmen to use time-sharing computers in one evening, and have them return models of the galaxy in a single semester. He has been in Israel setting up their first observatory. This is being done in collaboration with Tel Aviv University.

Roger K. Lee, principal engineer at Itek, Lexington, Mass., received a U.S. patent for a floating mark system which enables a photointerpreter to adjust his stereoscope to reduce eyestrain. Roger has been with Itek since 1963. . . . **Larry Lortscher** joined Cities Service Company, chemical and metals group, as manager

of their agricultural chemical division. Larry had been with U.S. Steel Corp. He and Nancy Ann (Kerrigan) have one daughter, Karen, age 18, and they live in Charleston, Ga. . . . From **John Powell**: "Since June 1967, I have been internationally assigned as plant manager of Union Carbide Corporation's Eveready Battery factory here in Nakuru, Kenya, East Africa. The job has proved quite a challenge from groundbreaking right on through maximum production. I have managed a little free time to see this beautiful East African country and wildlife. It is truly breathtaking." . . . **Ara Shrestinian** writes that nothing's new, family is fine; still assistant to the vice president, Thompson & Lichtner. Ara and Virginia have three children: David, 8, Susan, 5, and Stephen, 3. They live in Ballardvale, Mass. Ara is active in ASCE and ASTM.

Professor **Edward Stone** wants to know why I mailed my note from Brockton, Mass., when I live in Lexington. Ed, I bought into a company in Brockton, Mass., but I still live in Lexington—do you need any flexible circuitry? Professor Ed is at Florida State University in Tallahassee with their graduate school in mathematics education. He is single and, consistently, has no children. Ed, come to the reunion in June anyway, you'll have lots of company (at least four others in this month's notes). . . . And good ole **Sandy Sussman**, just when you catch up with him he does something else: our latest encounter—very prosaic: in New York City—informed us that Sandy has retired. Now he devotes his efforts to (1) manipulating the bundle that he made, (2) playing golf and tennis, and (3) generally enjoying himself. Judith and Sandy, have six children between them. This is a second marriage for both, and they both seem to be enjoying it together.

Lloyd Smiley is living in Hialeah, Fla., where he was recently elected president of Jet Avion Corp., manufacturer of jet engine and other critical engineering parts. In addition he serves as chief officer of Space Science Services, a company that performs nondestructive testing of aircraft power plants. Lloyd has a rather impressive record. In addition to his M.I.T. degree, he has a degree in philosophy from Marist College. He de-

veloped computers and operating gear for the five-site hydrogen bomb complex in South Carolina, was a four engine air force airplane commander (served in the African and European combat areas), and has a commercial, instrument rated pilot's license which allows him to fly his own six-passenger Beechcraft. Lloyd and Connie have four children ages 14 through 22.

George L. Thompson, another of our single classmates, is on leave of absence from Rochester Institute of Technology where he is on the faculty in the Electrical Engineering Department. I'm sure that the Class joins me in extending our sympathy to George on the loss of his father. George suggested that the Cancer Fund or M.I.T. cancer research (?) be the recipient of remembrances. . . . **Frank Tully**, Vice President of Product Engineering at the Motor Wheel Corporation, a subsidiary of Goodyear Tire & Rubber Co., was recently elevated to a new post as director of production for the Kelly-Springfield Tire Company (another subsidiary of Goodyear). Frank and Dorothy have moved to LaVale, Md., so that Frank can more closely direct the operations of the company at Cumberland, Md. as well as three other plants. The Tullys have five children: Frank 17, Kathleen 15, Linda 14, Mike 11, Steve 9. . . . **Elizabeth and John Vernon** are back from Greece and living in Mountain Lakes, New Jersey. They have three children: Elizabeth Ann, 14, John C., 12, and David W., 6.

Since none of our reminders ever get action, I will merely suggest that you mark this as the year of our 20th reunion and should you be moved to action in behalf of yourself, our Class or your lonely class reunion committee, drop a note and we'll see that you are counted in on the activities leading to and from and including the reunion. It will be on Martha's Vineyard, Cape Cod, Mass. . . . Pax—**Howard L. Livingston**, Class Secretary, 358 Emerson Rd., Lexington, Mass. 02173; Assistant Secretaries: **Marshall Alper**, 1130 Coronet Ave., Pasadena, Calif. 91107; **Walter Davis**, 346 Forest Ave., Brockton, Mass. 02402; **Paul Smith**, 11 Old Farm Rd., North Caldwell, N.J. 07006

The mail this month is unusually abundant. **John Small, Jr.** writes that after four years in the Hague he has moved to Madrid as senior geologist for AMOSPAIN (American Overseas Petroleum Ltd.) in "a field geologist's paradise." . . . A note from **James R. Strawn** says that he is now division geophysicist of the newly expanded Denver division of Chevron Oil Company. . . . The director of distribution services for the Stop and Shop companies is now **Richard H. Silverman**. . . . **Howard W. Harding** writes that he is now president of Loddington Engineering Corp., a subsidiary of Thermo Electron Corp. of Waltham, Mass. Howard's address is 6 Surrey Lane, Worcester, Mass. 01609.

My thanks to **Dana Ferguson**, past class secretary, who is now living in sunny Florida (Box 2553, Sarasota, Fla. 33578). Dana has sent a news release announcing that **Charles E. Bethel, Jr.**, has recently been named vice president of development and marketing of Signal Chemical Co., Los Angeles. Mr. Bethel has been active in product and market development at the company's offices in Houston, Texas, where he will continue to make his headquarters. . . . A note from **Jack Larks** indicates that he is working in the field of earth resources studying remote sensing techniques as a means of evaluating all resources. Jack is vice president of the M.I.T. Club of Houston and invites all visitors to contact the Club at 483-7461 for information on activities and a tour of the Space Center.

Bob Ehler writes that he is advanced planning manager of the Jet and Ordnance Division of T.R.W., Inc., manufacturers of components for jet engines. Bob, his wife Phyl, and their two daughters live in Lyndhurst, Ohio, a suburb of Cleveland. . . . **James H. Bunting** is now principal engineer at Rixon System Development Laboratory in North Billerica, Mass. Jim lives in Acton, Mass. with Martha and their five children. . . . **Joe F. Moore**, his wife Glenna, and their five children, one of whom is now a junior at Texas University, still reside in Houston. Joe is president of the management consulting firm of Bonner and Moore, Houston, New York and Brussels.

Howard K. Larson writes that he is currently the NASA-Ames representative on the Technology Working Group for space shuttle structures, materials and thermal protection. Howard is still writing papers on cross-hatched ablation patterns.

Another welcome long letter has come from **Bill Ferguson, Jr.** Bill, who lives out in Arizona (340 Lenzner St., Sierra Vista, Ariz. 85635) has become somewhat of a cattle baron in an effort to invest some money and save on the inevitable taxes. He is planning to spend more time on his feeding and breeding activities with the coming closure of Phelps Dodge's Copper Queen Branch where he is now working. Bill says he would be glad to

hear from any classmates with useful advice.

The local papers report that **Joe Alibrandi** has been elected to the newly created position of executive vice president of Whittaker Corp. of Los Angeles. Joe has also been elected a member of the executive committee and Whittaker's board of directors. He will serve as the company's senior operating officer. With his election to this new position Joe Alibrandi completes a distinguished 18-year career with Raytheon, where he started as industrial engineer. . . . Many of you will remember **John T. Fitch**, past president of the class, and his work as announcer on Boston's radio stations. Recently, John has been appearing frequently in advertising for the Ford Motor Co., on radio and in the Boston newspapers. As an "engineer and science reporter," John gives his usual professional presentation.

Wang Laboratories has recently announced that **Lowell W. Smith** has been named product manager for desk calculators. . . . **Michael J. Godkin** has become marketing manager of the General Electric Co., Power Circuit Breaker Dept., in Philadelphia. . . . **Frank C. Wilson** was recently appointed senior research chemist in the research and development division of the du Pont Company's Plastics Department.

Members of the class will be saddened by the news that two of our classmates passed away earlier this year. **William P. Van Riper, Jr.**, died March 21, 1970 and **Louis B. Lambert**, died April 14, 1970.—**Arthur S. Turner**, Secretary, Lowell St., Carlisle, Mass. 01741

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The second weekend of June saw the 15th reunion of our Class underway. A Friday evening Homecoming cocktail party at the Institute was followed by a day of reminiscing and reacquaintances at the Black Point Inn in Prouts Neck, Maine. The weather was sunny and cool, and there was tennis, swimming, or just walking along the beach for enjoyment after a buffet lunch. A lobster dinner completed the day, and in the evening there were films of the 10th reunion, dancing, and a meeting with Glee Jackson presiding. A new slate of officers was elected for the Class: they are L. Dennis Shapiro, President; F. Eugene Davis, Vice President; Edward Ehrlich, Jr., Treasurer; Allan Schell, Secretary; and Paul Attridge and Frederic Morgenthaler, Co-chairman for the 20th reunion. Peter Toohy agreed to continue as Class Agent. There was a warm expression of appreciation for the years of service of Dell (Lanier) Venarde and Denny Shapiro as class secretaries. Ed Ehrlich had obtained Florentine coin ashtrays as mementos of the reunion, which ended with a Sunday morning breakfast and a ride back to Cambridge. There were class members who had come east from California and north from Florida to attend; in future issues of *Technology*

Review we shall report more of the news gleaned at the reunion.

Jackie and **Bill O'Neil** missed the reunion because they were spending the weekend in Hong Kong. They have left the Philippines, and mention that after eight years of foreign work, they might settle in the U.S. . . . **Bill Bohnert** is an art director for CBS-TV in New York. He designs for the Ed Sullivan show, and recently finished designing scenery for the 5th Dimension Special. He received the M.F.A. degree after three years at Yale Drama School, and he and his wife Pamela have three boys. . . . At a meeting of the American Society of Civil Engineers held in Boston in July, **Robert H. Murphy**, Director of Transportation Planning of the Boston Redevelopment Authority, presented a paper that should be of more than passing interest. The title was "Does More Traffic Mean More Pavement?"

Tom A. Thliveris has moved to Phoenix, Ariz., after a 14-year residence in Utah. He is now an architect with Charles Luckman Associates. . . . Reverend **William H. Nichols, S.J.**, who is associate professor of physics at John Carroll University in Cleveland, Ohio, has co-authored three articles in the *Journal of Chemical Physics* on acoustic and light scattering studies of liquids. . . . **Eldon Reiley** writes that he is practicing law in a small firm that he founded in Spokane. He also teaches at Gonzaga Law School and is a trustee of Spokane Community College. These activities plus the demands of three young daughters make his life seem quite education-oriented at the present. . . . **Peter Brand** graduated from Albany Medical College in May, 1970. He will intern at the Maine Medical Center in Portland.

The subject of acoustic holography is the new specialty of **H. Robert Farrah**, who is a manager of program planning at Bendix Research Laboratories in Southfield, Mich. He recently wrote a tutorial paper on the subject for the *Bendix Technical Journal*. . . . I hope that in the months ahead, I shall be able to maintain as interesting a column as our previous secretaries have. You can raise the odds greatly if you will send me information about yourself or other classmates.—**Allan C. Schell**, Secretary, 19 Wedgemere Ave., Winchester, Mass. 01890

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As we enter our fifteenth year, the leading item on everyone's calendar should be Edgartown, Massachusetts, June 4-6, 1971. The bare bones of a reunion committee met on Homecoming Day, 1970. Additional help is needed—so volunteer.

Ray Bowen has been promoted to professor of chemical engineering at the University of Wisconsin. As a member of the faculty executive committee, he has been occupied with campus problems for the past year. . . . **Phil Bromberg** became

an associate professor at Carnegie Mellon in September. Nancy and the two children were happy to move into their new house in May. . . . **Kreon Cyros** helped develop the computer software known as INSITE II, which controls space allocation in M.I.T.'s buildings, and he has presented papers on the subject to university groups. . . . **Murray Gerber** started his own business two years ago—Prototype and Plastic Mold Co. in Rocky Hill, Conn. The firm specializes in making prototype mold from epoxy materials for injection molding plastics.

Carl Hayunga is manager of substrate process equipment of IBM at Poughkeepsie. Carl spends his spare time motorcycling and skiing. . . . **Bob Heath** has joined the staff of the ACS Chemical Abstracts Service. Bob received his Ph.D. in medical microbiology in 1969 from the University of California and is associate editor of the biomedical department. . . . **Paul Polishuk** is a Sloan Fellow at M.I.T. this year. Paul is on leave from his position as senior research physicist and chief of the plans office at the Air Force I Light Dynamics Lab. . . . In June Major **Bill Randolph** graduated from the Army Command and Staff School at Fort Leavenworth and was assigned to Germany.

Ernest Wolff joined UNESCO in 1968 as a specialist in applied metallurgy. Ernest, Penelope and their five children have just returned to the U.S. from the University of Lagos, Nigeria, where he was teaching and setting up courses in metallurgy. While there, Penelope taught music and both played in the Pro Musica. . . . Denise and **Ed Zoolalian** had their third child and second daughter in January. Thoroughly entrenched in Southern California, Ed is manufacturing manager of Neff Instrument, a producer of DC amplifiers.—Cosecretaries: **Bruce B. Bredehoft**, 3 Knollwood Dr., Dover, Mass. 02030; **T. Guy Spencer, Jr.**, 73 Church St., Weston, Mass. 02193

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And here we go again with another volume of *Technology Review*. A number of you have sent in some news. . . . **Ernest Peixotto**, now a lieutenant colonel in the army, writes that he was in Vietnam for twelve months in 1968/69 commanding a combat engineer battalion in the Mekong Delta. Then following a year as a student at the National War College, he has moved to Vicksburg, Mississippi to become director of the Waterways Experiment Station. . . . Some old news (January, 1970): **Jay Bonnar** has joined Handy and Harman, Fairfield, Conn., as new products manager. Jay was formerly with Anaconda American Brass Company where he held the post of research administrator. . . . There was recently an interesting article on **Dick Adams** in the Lexington, Mass., *Minute Man*. I quote in full: "A Bedford resident, Richard H. Adams, believes his firm has an answer for inventors of new products who face persistent problems of where to find re-

liable advice for protecting their product or idea, proper sales presentations, professional representation and national marketing contacts. New Product Development Services, Inc., a Kansas City-based firm, announces the opening of a franchised office in the Greater Boston area, called New Product Development Services of Boston located at 176 Second Avenue in the Waltham Industrial Park. The firm offers complete assistance in services of disclosure protection, marketing analysis, patent search, presentations, financing, licensing arrangements for royalty payments and all related matters in new product development. Realizing that many ideas and products are originated by 'amateurs' who lack the expertise and necessary contacts, yet whose inventions may prove commercially feasible and saleable if properly protected and developed, it was decided by the principals to use their background experience and knowledge in this field by offering their services to the public on a reasonable fee and commission basis. In fact, consultations are offered free to determine the merit and potential of the product. The managing director of the Greater Boston offices, Adams is the vice president—treasurer of Technology Development Corporation, the holder of the franchise. He holds B.S. and M.S. degrees in engineering from the Massachusetts Institute of Technology and for the past six years has been program manager and associate department head at the MITHRAS Division of Sanders Associates, Inc. He has been active in Bedford community affairs and is now a member of the Municipal Building Study Committee and the Republican Town Committee." . . . **Ron Delaney** is now a development physicist and manager of photolithographic and diffusion product engineering and also an Assistant Professor of Physics (part time) at Trinity College in Burlington, Vermont. He is married and has four children.

The subject of one of the *Boston Herald-Traveler's* series of articles on "eligible bachelors" was our **Guy Carbone**. Guy is now chief of engineering and construction for the Commonwealth of Massachusetts. His views on women and marriage were termed old-fashioned by the writer (a woman). Here are some extracts from the article: "I don't like women who smoke, chew gum or wear a lot of make-up. I think wives should get up and make breakfast for their husbands. She should be committed to her husband, family and home. But not to the exclusion of community projects, say a women's voter organization or the like," he said. Carbone goes on record of not liking women who are bossy. But neither does he like clinging vines. "A little independence makes it interesting," he said. Carbone thinks some modern women have their values and goals mixed up. "Careers are fine, temporarily. But a woman was meant to be a wife and a mother. And that can be just as fulfilling and rewarding as any career." The article goes on to say that Guy divides his time among a variety of organizations including the Boston

Association for Retarded Children. He was selected as BARC's man of the year in 1967. Also, Guy is the only bachelor on the school committee in Watertown.

Harry Johnson, who is associate professor of finance at the University of Connecticut, has been elected a member of the board of trustees at the Windham Community Memorial Hospital. . . . **Carl Hagge** has been appointed program manager by American Science & Engineering Inc. of Cambridge. . . . And, the last items for this issue—two birth announcements: **Uzal Martz** reports the birth of his first child, a boy, in March. . . . Betty and I have been blessed with the birth of our second child, a boy, in Helsinki in July. More in 30 days.—**Frederick L. Morefield**, Secretary, Tiirasaarentie 17, Lauttasaari, Helsinki 20, Finland

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Welcome back after what we hope was a restful but busy summer. . . . Among other items gathered by our fast intelligence network, we find that **John Ingraham** has recently joined the staff of the Los Alamos Scientific Laboratory where he will be working in the physics division. John and his wife, Karen, had just completed their move to Los Alamos in early summer. . . . In Shreveport, La., **William Anzalone** was one of the featured artists at a three-man exhibition at the Sadler Gallery. He is an assistant professor at the University of Houston and has also taught one year at the Houston Museum of Fine Arts School. Also, he has had one-man shows in numerous cities in the Southwest. . . . In July, **Daniel Brand** presented a paper at the National Transportation Engineering Meeting of the American Society of Civil Engineers held in Boston.

A short note from Mayra and **Jorge Alfert-Perez** mentions that he is now manager of the Water Treatment Chemicals Group, part of the Industrial Chemicals Group, of W. R. Grace and Company in New York City. Jorge's work is oriented to the international markets and he spends much of his time out of the country. . . . **Frank Tahmouh** writes, "have been with Polaroid Corporation the last five years, initially as manager of process quality, and recently promoted to the position of manager of vendor relations." . . . **Ahren Sadoff** is chairman of the physics department at Ithaca College and visiting research fellow at Cornell University. . . . **Fred Nadel** has accepted the position of audit manager for Occidental Petroleum Corporation, and is living in Amherst, N.Y. . . . **Robert Thomson** is currently director of personnel for the South Bend division of the Bendix Corporation in Indiana. . . . During the coming year, **Ira Schwartz** will be serving as secretary of the New York Chapter of the Society of Photo-Optical Instrumentation Engineers. In June, Ira received the Robert Morris Memorial Service Award for service to this chapter during the 1969-70 year.—**Michael E. Brose**, Secretary, 199 Sudbury Rd.,

Concord, Mass. 01742; **Antonia D. Schuman**, Assistant Secretary, 22400 Napa St., Canoga Park, Calif.

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Welcome Back! I trust that you all had a very enjoyable summer and are now anxious to catch up on all the news of classmates around the country. In news from the academia . . . M.I.T. announced the recent promotions of **Leon Glicksman** and **Daniel Wang** to Associate Professors in the Departments of Mechanical Engineering and of Nutrition and Food Science respectively. . . . **Jon Weisbuch** is presently an Associate Professor in the Department of Community Medicine at the Boston University Medical School. . . . **Dick Giglio** informs me that he is currently an Associate Professor of Industrial Engineering on Operations Research at the University of Massachusetts, and that he and his wife Sally have two lovely daughters ages seven years and three months. . . . **Joel Parks** is Assistant Professor in the Physics and Electrical Engineering Departments at the University of Southern California. He writes that he is enjoying California sun with wife Carol, sons Jess (9), and Ethan (6) and daughter Leah (1). . . . **John Jackson** is Assistant Professor of Chemistry at the University of Maryland with publications in the areas of polymer crystal morphology and thermodynamics.

I received a brief note from **Bill Van Tassel** who writes: "Greetings! After finally finishing a Ph.D. we moved to the University of Illinois. Martha joined us last September to become the first Illinois native in the family. I see **Kent Kresa** and **Charles Baker** infrequently. Best regards to all. Bill, Jean, Peter and Martha." . . . A recent press release announced that **Herb Champlin**, currently Chairman of the Board of Champlin Exploration, Inc., was named to the Board of Trustees of Phillips University, Enid, Okla. Herb is also a Board Member of both the Enid Chamber of Commerce and the First National Bank of Enid. . . . **Neil Harper** informs me that his McGraw-Hill book *Computer Applications in Architecture and Engineering* has been published in Japanese, and also that he's had a recent article on high-rise office design

published in Danish . . . Bravo! . . . **John Van Raalte** represented the Institute at the recent inauguration of the new president at Rider College. . . . **Dave Kline** is currently a co-investigator at S.U.N.Y.A. conducting NMR and EPR studies of lunar materials (moon rocks?). Dave received his Ph.D. in physics from Brown in 1964 and has been at S.U.N.Y.A. since 1966. Dave and his wife Sara now have two children, Eric, age 5 and Sean, age 3.

Frank Schmaltz received his M.B.A. from the University of Cincinnati this past June. . . . **Tip Noe** announced the arrival of daughter #3 born on June 8. . . . **George Barnett** announced that wife Susan gave birth to daughter Leslie Ann on April 7. . . . **Bob McAuliffe** writes that wife Lydia gave birth to daughter Kirsten last January. . . . three cigars coming up! Bob also informs me that he recently left Cabot, Cabot and Forbes to become Executive Vice President of L. T. Developers Inc, a subsidiary of Landtect Corp. of Philadelphia currently developing a 3,000-acre heavy industrial complex in southern New Jersey.

A recent press release announced the receipt of an Oak Leaf Cluster to the Army Commendation Medal by Major **Bob Doleman** upon completion of his tour at the White Sands Missile Range. Bob has been on active duty for ten years and has served tours in Europe and Vietnam. . . . Still on the military front, I received a press release announcing the graduation of Major **Ken Kawano** from the U.S. Army Command and General Staff College at Ft. Leavenworth, Kansas. Ken is currently serving in Vietnam.

Bruce Wooden joined the Naval Ship Research and Development Center as Head of the Ship Feasibility Division of the Ship Concept Research Office in Washington, D.C. . . . A short note from **Carlos Prieto** informs me that after graduation he joined Fundidora de Monterrey, S.A. (Mexico's largest private steelmaking firm) where he is now Vice President-Production. Carlos is married with three children. . . . Also from south-of-the-border, I received word from Warren J. Henderson, Class of '33 Secretary, that classmate **Juan von Bertrab** attended the recent M.I.T. Mexico City Club Fiesta. . . . Also received word that **Brad Bates**

and **Bruce Silberg** attended M.I.T. Homecoming 1970.

Received a newsy note from **George Bloom** who writes, "This is my first entry since graduation. I have been in Burlington, Vt., since graduation. With my wife Arline and daughters Karin, age 7, and Elise, age 5, we have been living the good life up here. I received an M.S.M.E. degree from the University of Vermont in 1968. I am currently an Advance Design Engineer with the General Electric Co."

Dick Drossler writes that he recently celebrated the first anniversary of the purchase of his company, Drossler Research Corp., from Campbell-Ewald Advertising (Detroit). It had been a wholly owned subsidiary. According to Dick, his company is one of the largest marketing research and marketing consulting firms in the West with offices in Los Angeles and San Francisco. . . . **Dave Brahm** is manager of TF34 Systems and Performance Analysis Operation at General Electric in Lynn, Mass. He lives in Peabody with wife and son age 7. . . . **Harry Scherzer** writes that since graduation he has worked for National Distillers and Socony Mobil in sales and marketing. At present, he is Director of Marketing of Consumer Products Group for Amerace-Esna Corp. . . . Well, I guess that's about all for this issue of class notes. Remember to keep those cards and letters coming in and I'll be talking to you next month. Until then, take care.—**Arthur J. Collias**, Secretary, Technical Forum Associates, Inc., 545 Technology Square, Cambridge, Mass. 02139

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The tenth reunion in June was a terrific party! Of course, we also managed to transact some class business, so I will get that out of the way before telling you all about everyone who was there. The "business meeting" was duly conducted after dinner on Saturday night, after an appropriate cocktail party. **Gerry Hurst**, worthy class president, presided. The first motion, passed with no dissenting votes, was to constitute a planning committee for the 15th reunion composed of all members present at the 10th. Then **Mike Padlipsky**, chairman of the nominating

committee proposed amendments to the class constitution which were also accepted with no dissenting votes. The intent of these motions was to add to the list of class officers regional vice-presidents whose duties include preparation of one class notes column each year; the other intention was to add to the list of officers the reunion chairman of the next reunion.

Next on the agenda was election of class officers to serve for the next five years. The lucky (?) winners were: President Tom Farquhar; Regional Vice Presidents—West Coast, Bill Eldridge; Midwest, Dick Davidson; and East Coast, Ron Koetters; Secretary, Linda Sprague; Treasurer, Ray Harlan; Class Agents, Noel Bartlett and Burgess Rhodes; Chairman for the 15th Class Reunion, Ralph Buncher.

From then on the "meeting" disintegrated with the presentation of a variety of valuable gifts and awards. To mention only a few, we managed to unload great numbers of leftover Senior Week Beer Mugs, etc., in the following manner: Polly Hurst won the Nursing Mother Award (a mug full of milk); Nancy Siegel won the "Largest Number of Potential Children" Award; Steve Laveson won the award for the greatest number of employers since 1960; Ralph Buncher received the "Largest Net Gain of Hair" Award (side-burns on the man who won the least hair award in 1965); Bill Eldridge won the "longest distance" award for coming from Seattle; Jim de Sola won the "most circuitous route to the reunion" award for his travels from Curacao to South Egremont; Lester Seigel won the prize for most impressive job title (President); Section 4, which was heavily represented won a fistful of old (useless) drink chits; and Mike Padlipsky was given a very special prize—a Southern Bell. If I can ever con him into writing another set of class notes, he may provide an explanation for that one. Tom Farquhar, as outgoing reunion chairman, got a copy of the November 1961 *VooDoo*—which may turn into a collector's piece some day since that worthy publication has now folded. And I would certainly like to express my appreciation for the two awards given me to provide "inspiration"—a bottle of champagne and a copy of *The Wisdom of Spiro T. Agnew*.

That takes care of the business end of things; now let me tell you who was there. Marge and **Bob Keeney** came up from Pennsylvania where Bob is industrial sales manager, low voltage switchgear, with General Electric. Charlene and **Bill Eldridge** came all the way from Seattle; Bill is an aerodynamics research engineer with Boeing. Marge and **Morris Salame** were there; Morris is research manager from Monsanto. Kathy and **Noel Bartlett** came up from Ohio where he is a management science staff associate with Sohio. **Bruce Layton**, who is an operations research officer with the Air Force showed up to get in a few licks in a bridge game that went on all weekend. Miriam and **Stu Schwartz** arrived with

their two children; Stu is associate professor at Princeton. Cindy and **Dan Whitney** left the children at home (as did the Spragues); Dan is an assistant professor of mechanical engineering at M.I.T.

Pennsylvania was well represented—Audrey and **Burgess Rhodes** were there; Burgess is an associate of Daniel H. Wagnes, Associates. Sara and **Ed Pollard** arrived late, but still in time for all the festivities; Ed is with KEV Electronics. Sandra and **Steve Laveson** were there; Steve is a security analyst with Neuberger and Borman. By the way, the company that **Les Seigel** is President of is Unitec Enterprises, Inc., in New York City.

Madeleine and **Jim de Sola** did indeed come up from Curacao, but via some of the most forgettable spots in the Midwest. Jim is, among other things, managing partner of Edwards, Henriquez & Co., and general managing director of Prospero Baiz & Co., Inc. and lists his employer as "own business." . . . All in all, it was a great way to spend a weekend. Let's do it again sometime, but on an even greater scale.

Larry Elman couldn't make the reunion; he spent that weekend at the Connecticut Air History Museum at Bradley Field near Hartford working as a volunteer guide. He sent me full instructions for getting to the museum, so just write if you're interested in seeing what sounds like an incredible display of renovated planes.

There's lots more news, but not enough space for all of it this time. So, continued next month. . . . In the meantime, send your version of the world to—**Linda Sprague**, 10 Acorn St., Cambridge, Mass. 02139

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This article is being written in the glorious summer sun of Seattle, so my outlook is optimistic. The top news of the year is the acquisition by Boise Cascade Corp. of Communications-Research-Machines, Inc., a New York and Del Mar, California, publisher founded just a few years ago, by **Nicolas Charney**, for \$21 million in Boise stock. The company established the successful magazine *Psychology Today*, and is active in other educational activities. *Careers Today*, a publication that was terminated after four issues, was also started by the firm. An amazing feat, particularly in this year of the toppling of former high-flying heroes. Congratulations, Mr. Charney.

That's quite a starter, but don't go away, I have more. **Terry Bray** was named a partner in the law firm of Graves,

Dougherty, Gee, Hearon, Moody & Garwood in Austin, Texas, where he has been practicing law since 1966. In May he was offered a position as Assistant Solicitor General in Washington, D.C., which he began in August. He will be there for two years and then return to his Austin law firm. Terry and Judy have a girl and two boys, ages 1, 6 and 7. He can be reached through the Department of Justice. Congratulations, Mr. Bray.

I read that Ralph Nader's suit to prevent smoking on airplanes was dismissed, but I thought this was being pursued by our own **John Banzhaf**. Maybe John shouldn't have turned it over to Ralph. Anyway, John is busy with SOUP (Students Opposed to Unfair Practices) which is fighting the FTC and Campbell Soup, LASH (Legislative Action on Smoking and Health), GASP, which is fighting the Transit Authority on pollution, and PUMP, which worries about selling the same gasoline under different brand names. Right on, Mr. Banzhaf.

Donna and **Bob Wilhelm** should have moved from Bogota to Cartagena, Colombia, by now, where he will be manager of all of the International Petroleum Company's operations on the north coast of Columbia. These consist of two refineries, an ammonia plant, crude oil pipeline, export terminal, etc. Total employment is 700 and the investment around \$70 million. Bob's work to date has involved economics and planning, supply, and marketing. Congratulations, Mr. Wilhelm.

Dr. **Gerald Fleischli** has joined the faculty of the University of Nebraska Medical Center as assistant professor of preventive medicine and public health. For the past year he has been an instructor in community health at the University of Missouri. He received his M.S. and M.D. degrees from Stanford University. . . . **Donald C. Fraser** was coauthor of an article titled, "Guidance and Navigation Requirements for Missions to the Outer Planets," presented at the AIAA 8th Aerospace Sciences Meeting in New York last January. . . . **Earl Ruiter** spoke on systematically exploring alternatives in transportation at an American Society of Civil Engineers National Transportation Engineering meeting in Boston in July. He also presented a paper on inter-town traffic models in Amsterdam, and visited London, Manchester, and Paris on the trip. . . . **George N. Krebs** was named an assistant professor in the physics department at Marietta College in Marietta, Ohio. He received his M.S. and Ph.D. degrees at Rutgers State University.

William H. Jackson, Jr., was transferred by Texas Instruments to Austin, Texas, in the military computer group. He and his wife, Gerry, adopted a baby girl, Julie Katherine. . . . **Martin Carl Poppe, Jr.**, is director of engineering for Beukers Laboratories in Hauppauge, N.Y., and is a member of the board of directors of the M.I.T. Club of Long Island. . . . **Barry Fidelman** is Eastern sales manager

for Data General Corporation, makers of NOVA and Supernova computers. He and his wife, Jennifer, have two children.

Now assistant professor of economics at the University of Alabama in Birmingham is **Henry McCarl**. He received his Ph.D. in mineral economics from Penn State in December, 1969, and was recently elected president of the Birmingham chapter of the American Marketing Association. . . . **Tom Mantel** is continuing post-doctoral studies at the University of Paris. . . . **Harry McCraw** is receiving his Ph.D. in English from Tulane University. He and his wife, Shirley, have a daughter, Cynthia Jean, born this past January. . . . **Theodore Sheskin** has worked for Digital Information Devices, a small new company outside Philadelphia, since November, 1968. The company produces magnetic tape units. . . . Now located at the Naval Ship Research and Development Center in Washington, D.C., as the amphibious assault landing craft program officer is Lt. **Michael R. Terry**.

Stephen Root has joined "DEC" (whatever that is) as a programmer. His wife, Marcia, is at Stone & Webster as engineer, air pollution control. They have three children, Jonathan, David, and Meredith, ages 5, 2, and 8 months, respectively, and are living in a big old house in Brookline, Mass. Marcia is M.I.T., class of 1963.

Eugene Finkin was married on April 19 to the former Lillian Weiss, a Smith graduate. He has developed some revolutionary techniques for solving piston engine engineering problems in his position at Mechanical Technology, Inc. in Latham, N.Y. He has published over 20 papers, which he thinks is a class record—any arguments? . . . **Frank Rubin**, who has been taking extension courses at Syracuse University while working at IBM will now be attending full time and working towards a Ph.D.

Dr. Johnathan Glass finished his medical residency at Peter Bent Brigham Hospital in Bethesda and is now embarking on a fellowship in hematology.

Herbert Selesnick received an M.I.T. Ph.D. in political science in June based on his dissertation titled, "The Diffusion of Crisis Information: A Computer Simulation of Soviet Mass Media Exposure During the Cuban Missile Crisis and the Aftermath of President Kennedy's Assassination." He has been promoted to senior associate of Harbridge House, Inc., an international management consulting firm headquartered in Boston.

Gary A. Griess has begun post-doctoral work on physical chemistry of ocular proteins at the University of Rochester in New York. He and his wife had a daughter, Kristine Elizabeth, last March.

My class notes have been coming back from the *T. R.* editors with so many grammatical and other corrections that I'm worried they'll begin giving grades

soon—I can envision a resounding D.—**Gerald L. Katell**, Secretary, 13751 S.E. 20th St., Bellevue, Wash. 98005

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During the long summer gap between *Technology Review* issues, I received only one visitor and one letter from the Class of '64. One of these Class Heroes is **Rick Fisher**, who came wandering through Memphis on his way back to Montreal from a California visit. Still single, Rick is a management consultant for Kates, Peat, Marwick & Co. in the transportation division. For his one evening on the town, my wife and I took Rick to the greyhound racetrack in West Memphis, Arkansas. I came out 20¢ ahead, but I think Rick emerged with his tail (and his money) behind!

The other Class Hero is **Warren Wiscombe**, who wrote to say that he recently received his Ph.D. in applied math from Caltech this June. During his years of study, he also worked for Systems, Science & Software in La Jolla. Following his Ph.D. and the birth of a son this April, Warren and his wife are relaxing and pursuing various sports, such as scuba diving, glider piloting, etc.

And now for news of others: **Julian Adams** worked for four years with MITRE Corp. after receiving his M.S. from Stanford in 1965. He is now selling cars for Adams Motor Co. in Lynchburg, Va., and is a part-time physics instructor at Randolph-Macon Women's College. His bachelor days are soon to end. . . . **Ed Arnn** will be leaving five years of air force life this October. He and his wife Jo Ann are looking forward to civilian life and a chance to travel. . . . **Steve Brostoff** is a biochemist at the Salk Institute in San Diego. . . . **Truman Brown** has been appointed by M.I.T. President Howard Johnson to be a member of a task force to decide if M.I.T. should undertake a coordinated, large-scale program in environment quality research.

Rumor has it that **Peter Cooperberg** was recently married in Cyprus to a Canadian girl and is now living in Israel.

Don Faber, who received his Ph.D. in neurophysiology from the University of Buffalo, is now on a fellowship at the Max Planck Institute in Germany. Don and his wife Jo have two daughters.

John Flagg is working on his Ph.D. dissertation in English at Boston University. He expects to finish by next June and commence college teaching. . . . **Conrad Grundlehner** is a founder of Simumatics, Inc., a computer software company located in Haddonfield, N.J., that plans to specialize in the area of investment policy research using simulation techniques. He hopes to receive his Ph.D. from the University of Pennsylvania next year. . . . **Mike Hale** is a project director with Human Factors Research in Los Angeles. He and his wife Wendy have a daughter born last December. . . . **David**

Hoover received an M.S. from M.I.T. in June of 1969. He then worked eight months as a project coordinator for Governor Luis Ferre (M.I.T. '24) in Puerto Rico and more recently in Howard Samuels' (M.I.T. '41) campaign for governor of New York. David is currently a planning director for the South Middlesex, Massachusetts area Chamber of Commerce. . . . **Dick Lipes** received his Ph.D. in physics from Caltech last year and is now with the navy at its post-graduate school in Monterey, Calif. Rumors of his imminent marriage are probably true.

Jerry Luebbbers is learning to live with Californians and with the real estate business in a time of no money, so he reports. . . . **Michael McHugh** is a field engineer with GE's Installation and Service Engineering Dept. . . . **Bill Nelson** received his M.B.A. from Rider College this June. . . . **Donald Reed** is with Haley & Aldrich, Inc., consulting soil engineers. He is engaged in site investigations for highways, dams, airfields, etc. . . . **Marcia Root** is a pollution control engineer with Stone & Webster. She and her husband Stephen (M.I.T. '62) have moved into a large house in Brookline with their three children. . . . **Andy Silver** is presently teaching at Brandeis University. . . . **David Steelman** received his M.S.E.E. at the University of Santa Clara this June. . . . **Ed Wolcott** is living in Denver and is working for Gates Rubber Co., in its advanced products division. . . . That's the news for now. Let me hear from you. —**Ron Gilman**, Secretary, 5209 Peg Lane, Memphis, Tenn. 38117

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Steve Kaiser received the Karl Compton Award, which recognizes outstanding contributions in promoting high standards of achievement and good citizenship within the M.I.T. community, for his efforts as "an outspoken editor whose penetrating analysis untangled the complexities of the issues of the day." . . . **Dave Driscoll** will serve as assistant treasurer for the newly reorganized Charles Stark Draper Laboratory. . . . **Jim Breedlove** received his Ph.D. from Rice in physics in the field of molecular microscopy. . . . **Mark Strovink** completed his Ph.D. in physics last June at Princeton. Another Ph.D. recipient in physics was **John Holdren** who participated in the plasma physics program at Stanford and is now in the controlled thermonuclear fusion group at the Lawrence Radiation Laboratory. . . . **Bruce Golden** graduated from Harvard Law School, passed the Illinois bar exam and is with the Chicago firm McDermott, Will, and Emery. . . . **Bruce Morrison** finished his M.S. in chemistry at the University of Illinois and is now at Yale Law School. Bruce also served as the staff associate to the Dean of Students while at Illinois.

Howard Schiffman has been promoted to Captain in the Air Force Systems Command unit at Hanscom Field, Mass. . . . **Dick Ayers** has been promoted to Vice-

President of manufacturing of the Bates File Company in Newington, Conn. . . . **Henry Vickers** and **David Barber** have founded Entrex, a Lexington-based company which will manufacture a line of data preparation and entry equipment. . . . **Frank Mechura** has been promoted to Sales Manager of the Corrugated Division of the Continental Can Company. . . . **Phil Smith** reports the birth of a daughter, Christina. Phil is now the Cost Control Manager of the Burndy Corp. in Norwalk, Conn. . . . **Larry Hill** spent the past winter counting cars part-time for the highway department while touring the breeding farms in the deep South. He is currently planning a trip to Capetown, South Africa. —**Jim Wolf**, Secretary, Brigham Road, Gates Mills, Ohio 44040

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This column is the first to come from our new home in Colorado. Although we had not planned to, we bought a brand new house on the outskirts of town with a majestic view of the mountains. So if you're in Fort Collins, telephone us for directions to the house. You're always welcome.

The summer has seen a large number of letters accumulate at the Alumni Office. Basically, there are a lot of new degrees, several new babies, some job changes, and the usual number of honors and unusual occurrences. . . . Leading off the list of degree winners is **Norman Rubin** who received an M.F.A. in music from Princeton. . . . **Jim Gordon** completed his M.S. in aeronautics and astronautics at the University of Washington in June, 1968. He returned to the Boeing SST Division and is currently employed in the SST Flutter Group. . . . **Alan Tobey** received an M. Div. from Luther Theological Seminary in St. Paul this past May. This summer he is working with a psychedelic-drug treatment center in Minneapolis. In the fall he will join the Ph.D. program in religion and society at the Graduate Theological Union and University of California, Berkeley. . . . **Dave Penny** obtained a master's degree in Greek from the Dallas Theological Seminary. He has just returned from a tour of the Arab countries where among other adventures, he was allowed into an Al Fatah camp. He plans now to study Arabic in the Middle East and then devote the rest of his life to spreading the Gospel of Christ among the Moslems. Dave and his family treated me to a great steak dinner on my drive to Colorado last weekend.

Larry Daley finishes his Ph.D. in chemical engineering at Cornell this month and begins employment as a development engineer for Celanese Research in Summit, N.J., next month. . . . **Jeff Schwartz** received his Ph.D. in organic chemistry from Stanford in March and married Laraine Mittleman in April. His new position is as Assistant Professor of Chemistry at Princeton. . . . After three years of graduate work at Caltech, **Dave Wilcox** graduated with a Ph.D. in aeronautics.

He is working with TRW Systems in Redondo Beach, Calif., and intends to stay for a year or so until he goes out to set up his own firm. . . . **Grant Moy** took a J.D. degree from the University of San Francisco School of Law in June and joined the Department of Justice in Washington, D.C. as an attorney in the antitrust division.

Colin Whitney graduated with a Ph.D. in physics from M.I.T. in June and will stay there as an Assistant Professor in the Electrical Engineering Department. . . . **Ira Davidoff** received his M.D. from Harvard Medical School in June and will be interning at the Kaiser Foundation Hospital in Oakland. He spent this past spring working in a Public Health Service Indian Hospital in New Mexico, near the Navajo reservation. . . . **Norm Fainstein** and **Susan Bove** were married last May and live in New York "in the field," studying school politics. They are both Ph.D. candidates in the Political Science Department at M.I.T. Beginning in September Susan will be an Assistant Professor in the Department of Urban Planning at Livingston College, Rutgers, and Norm will be an Assistant Professor in the Department of Sociology at Columbia. . . . A note from **Jerry Abraham** says that he is moving back to Boston to intern at Children's Hospital Medical Center. I infer from this that he has recently received an M.D. somewhere.

Now for those still working in the Halls of Academia. **George Ivey** is working on a Ph.D. in mathematics at the University of Florida. He is married to Sandra Benjamin, a graduate of San Diego State College. . . . **Bob Pindyck** plans to complete a joint Ph.D. in economics and electrical engineering at M.I.T. in January. . . . **Roger Rasmussen** is still pursuing a Ph.D. in behavioral science with a career interest in large-scale change in publicly financed education. . . . **Gary Matison** just married Bonnie Shore from West Medford, Mass. He will continue going for a Ph.D. in electrical engineering at M.I.T. while Bonnie teaches elementary school in Medford. . . . From Captain **Grinnell Jones**: "Funny how after a few years you only remember the drinking beer and chasing women part of the educational process, so the world's least likely mechanical engineer is *working* on a master's degree at the Air Force Institute of Technology in Dayton, Ohio. Farewell Utah powder snow and other pleasures; it's thesis time."

The Baby Brigade has been active. Ann and **Harold Dershowitz** welcomed Joy Phyllis into this world on January 26. . . . **Jon Meads** has added Timothy David, age 1½ years, to his family. . . . **Mike Marx** had his first child, Jennifer Rebecca, on April 28. Actually, I guess his wife had her! Mike is a staff member at the Lincoln Labs. They have been back in Boston nine months after living in Los Angeles for two years. . . . **Mrs. Thomas A. Shields** and her husband are remodeling an old house in Weston as they try to keep pace with two active children—Tom, Jr., three years old, and Kisa, five

months. . . . Bev and **Dennis Jedlinsky** "were happy to welcome Diane Leslie, born February 20, to our family. She joins a brother David, 2½. Before Diane's arrival, Bev, a Simmons physical therapy graduate spent a year and a half working at Children's Orthopedic Hospital in Seattle. I am currently trying to hang onto my job in market research at Boeing in the midst of rather massive layoffs." . . . Janet and **Larry King** have now become "We Three Kings." I must confess that I lost the birth announcement, but I think it's a new baby girl.

After four years in the air force Captain **John Bobbitt** and his wife, Peggy Coulson of Wellesley, are in Guadalajara where Peggy is working on her Ph.D. thesis in economics. In the fall they go to Purdue where John will begin graduate work in mathematics. . . . **Bob Curd** just finished a tour of duty in Chu Lai, Vietnam. He was awarded a Bronze Star and two single mission air medals while flying 160 combat missions in the F4-B Phantom. He hopes to get aboard a carrier in the Mediterranean this coming spring.

George Leslie has completed almost four years with the navy, with a final rank of lieutenant. He has saved enough to think about pursuing a hobby in fiction writing that dates back to undergraduate days and Professor Barry Spacks's writers' workshop. He has enrolled in Japan's only film school, the Nihon University College of Fine Arts, and is the first American in the school's 40-year history. He estimates it will take about half a year to straighten out the Japanese he learned in the service over in Japan. After that, he may spend as long as two years studying screen writing and directing with an Oriental twist.

Lieutenant **Carl Jones** sent five legal-sized pages of notes on his movements since graduation which has to earn him the title of Class Hero of the Month for the longest ever personal report. Since space considerations preclude quoting the entire letter, I shall try to summarize. In June '68 he received an S.M. in civil engineering from M.I.T. and ten days later his draft notice. Successfully fending off the army, Carl was accepted by navy O.C.S. While waiting for O.C.S. to begin, he worked in the Computer Services Division of the State of Minnesota setting up their CRT entry state income tax system. "The system wasn't perfect when I left, but it was good enough to process my refund check!" Reporting to Newport, R.I., on April 19, 1969, he emerged eighteen weeks later as an ensign in the navy civil engineer corps. His permanent orders assigned him to Naval Mobile Battalion 133 in Gulfport, Mississippi, as a Seabee. In December he joined 133 in Vietnam about eight miles south of Hue where he was made Charlie Company commander. In January they left Vietnam to return to Gulfport to help repair the damage left by Hurricane Camille. His new orders are as officer-in-charge of a group of 150 men being sent to Saigon to supplement a battalion with a heavy workload. Carl is

due to get off active duty in August 1972, but with the reduction in forces, there is a good chance of getting out early. Whew!

Bob O'Donnell coauthored a paper presented at the Joint Automatic Control Conference at Georgia Tech in June. . . . **Mr. and Mrs. Panos Spiliakos** attended the 1970 Homecoming. . . . **Peter Brown** dropped a short note which unfortunately was unintelligible to me. Sorry, Pete. . . . **Steve Senturia** and **Tom B. Jones** were presented awards for excellence in teaching by M.I.T.'s department of electrical engineering. Steve, who received his Ph.D. with our Class and is now an associate professor, was honored for creativity and inspiration in teaching Introduction to Electronics, a course widely taken by undergraduate majors in physics and in aeronautics and astronautics. Tom was cited for his teaching of field theory courses. He received his S.M. in 1967 and expects his Ph.D. this summer. . . . **Dan Babitch** recently purchased a laser for his personal amusement and says it "is easily as much fun as a superball or a frisbee, although not as much exercise." . . . **Pete Cukor** is one of 14 outstanding young scientists who have been selected to receive postdoctoral research awards from the air force office of scientific research. In 1966 Pete received the American Institute of Chemists award for outstanding promise through demonstrated scholarship and leadership for advancing the professional aspects of the scientific community. He is presently at Cal Berkeley as a research assistant in chemical engineering. He'll use the postdoctoral fellowship at Harvard, working on the theoretical prediction of gas-gas immiscibility.

Mike Shorenstein and his wife just returned from a vacation in England this May and June. I'm mad at you, Mike, for not stopping by us in Oxford. Shame, shame! Mike is with Northern Research and Engineering Corp. in Cambridge.

Richard Kusper is with Lincoln Labs working on reentry measurements on Kwajalein Atoll in the Pacific. . . . **Vic Rosenberg** was recently appointed a vice president of Chesapeake Life Insurance Co. He has one son, Michael, two years old. . . . **Richard Troutner** has been elected vice president, manufacturing of Benthos, Inc., a producer of oceanographic instrumentation. Prior to joining Benthos in early 1968, he worked with E.G.&G. in the design of underwater lights and cameras for research submarines. He has published several articles on underwater equipment.

Matthew Fichtenbaum is an engineer with General Radio, working on computer related projects. He has "designed a programming system for a computer controlled digital logic tester, about which I gave a paper at Norem '69, wrote an article for *Electronics* magazine, and have answered innumerable customer questions." . . . **Bill Albertson** started his own company in partnership with four

other computer graphics specialists, including two other M.I.T. grads: **Dick Bator '64** and **Jon Meads**. The company, Vision Systems, Inc. is located in Bedford, Mass., and was founded in September 1969. Bill's previous employers were Adams Associates, Bedford, and Wolf Research and Development, Concord. On May 25, 1968, he married Lucia Cole, a 1966 graduate of Mass. General School of Nursing.

Alan Newhall works for the Los Angeles County Department of Public Social Services as a systems technician. He does systems analysis and work measurement studies for one of the largest welfare departments in the nation (15,000 employees). He expects to return to full-time study at the Southern California School of Theology in the fall. . . . From south of the equator comes a letter from **Bill Speaker** who works at the Adelaide Refinery in Australia. He continues his hunting activities (goat, kangaroo, dingo, and deer) and is "tediously" hand-checking the rifle stock. His wife of two years, Suzanne, is doing copy work with a local advertising group. . . . **Bob Fila** was transferred from planning and evaluation to retail planning and analysis in June. (But of which company?) In June, 1969, he married Honore Horan of Philadelphia, who has a B.A. from Clark University and an M.Ed. from the University of Pennsylvania. They recently purchased a townhouse and are thoroughly enjoying the dynamic environment of Houston. . . . **Mike Ward** is working in the radio physics lab of Stanford Research Institute and is also a sometime student in the Stanford Honors Coop program, which will take another three years for his Ph.D. That is, if he can successfully appeal his 1-A. . . . **Carson Eoyang** has been invited as a guest speaker to a three-week seminar in Taiwan on modern technology and engineering. He will lecture on manpower planning and control. He will be returning this fall to enter Stanford's Ph.D. program in business. He reports that **Ralph Schmitt**, **Jurgen Hahn** and **Rich Lucy** are all still at McDonnell Douglas Astronautics Company. . . . That's it for another month. Drop a line soon. Cheers.—**Terry J. Vander Werff**, P.O. Box 368, Fort Collins, Colo. 80521

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Mrs. **Bob Bruneau** writes that her husband was wounded last November in Vietnam. He returned to Valley Forge Hospital in January and is now a clerk at Fort Riley in Kansas. Hopefully, he will be able to leave the army early and return to school to finish the 1½ years remaining on his Ph.D. in mineral economics. His wife is holding down the fort as a systems programmer at Penn State. . . . Don, '68, and **Lucy Hodges** are living in Atlanta, having finished their Peace Corps service in Tunisia. . . . **Henry Link** is still working at Pratt & Whitney Aircraft in East Hartford, a job he has held since graduation. His specific task is in the development of an advanced military jet

engine that will have its performance and endurance tests this fall and will go into production next year. He and **Chuck Spann** went to the Young Alumni Business Seminar in Washington, D.C., where they met a few former classmates. In his spare time Henry is secretary and vice-president of Performance Automotive, Inc., which he and three other engineers formed. At present the only operating function of this corporation is the ownership and overall management of a Dan Gurney's Checkpoint America franchise, the first of approximately twenty to open in the U.S. this year.

Marilyn and **Dave McMillan** are expecting their No. 1 in November. They bought a house in Tewksbury and are enjoying suburban Massachusetts living. Dave received his M.S. in June and is working at MITRE. . . . **Stephen Rawlinson** received his commission as an officer in the navy last July and is currently stationed at the Pacific Fleet Computer Programming Center in San Diego. . . . In June **Mark Grossman** received his M.S. from Rutgers. . . . **Ted Nygreen** has an M.A. in sociology from Princeton. . . . **Stuart Orkin** and Roslyn Beth Weinstein of Newton, Mass., became engaged last spring. She is studying at Harvard, and Stuart is attending Harvard Medical School.

Carl Kalinowski wants to advise everyone that the California aerospace gold rush is over and that the mines are rapidly closing. Carl worked in Cambridge with N.A.S.A. until the center closed, and then relocated to lovely Santa Monica where he works at System Development Corporation as a programming analyst. He recommends the study of hatha yoga to people adrift in the tumultuous seas of aerospace. . . . **Victor Voydock** received an M.S. in math from the University of Illinois in 1968 and is currently working as a system programmer for Project MAC at M.I.T. . . . **Jerry Yochelson** is also with Project MAC. . . . **Danilo Santini** taught high school physics for the past two years and plans to study city and regional planning at Illinois Institute of Technology for the next three. . . . **Myron Sussman** has married the former Jill Jacobs, a graduate of the University of Pittsburgh.

James Cronburg is working for the Air Force Human Resources Lab, doing work that has nothing to do with his assigned field. He writes that Ellen and the little one, Turil, are doing beautifully. Turil has just discovered walking and is busy. Ellen is conducting a special summer program for local children. . . . **Richard Gostyla** is in San Francisco as assistant to the general manager of Air West, an 80 million dollar regional airline which Howard Hughes and Hughes Tool recently purchased. . . . **John St. Peter** joined the air force in June, 1969, and is an air traffic controller at a mobile radar site at Williams AFB, Ariz. . . . **Richard Dower** received his M.A.T. from Harvard in 1969. He is now teaching physics at Milton Academy and enjoying the hectic life at a boarding school. . . . **Bill Carter** is in his third year at Harvard in the

Ph.D. program in history and far eastern languages. . . . **Don Berliner** is at the University of Pennsylvania seeking his doctorate in systems engineering and operations research. A thesis and a job remain to be found. . . . Linda and **Markus Zahn** have been married since June, 1969. They are expecting a baby in December and hoping that it is a boy. Markus is instructor of electrical engineering at M.I.T.—**Jim Swanson**, 1816 First Avenue North, Grand Forks, N. Dak. 58201

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Here we are again after a long summer vacation free from writing the column. Gail and I spent most of the summer at M.I.T. working on our theses except for a two-week trip to the coast in June, which was motivated by the IEEE Communications Conference in San Francisco. We borrowed a car from my sister in Phoenix and drove to L.A., San Francisco, Yosemite, Las Vegas, and the Grand Canyon—about 2,700 miles. It was a great trip; I only wish we could have stayed longer. While visiting Caltech, we bumped into **Glenn Veeder**, who is studying astronomy there. We also met **Carolyn** and **Gary Bjorklund** in San Francisco, and spent a day with them which included a trip to one of the local wineries and a thorough sampling of their products. . . . Our drive to get people to have their class affiliations straightened out is working, so we'll head off the column with those who have answered the call.

Class Heroes

Ralph Rosenberg is a graduate student in biophysics at the University of Chicago on a U.S. Public Health Service traineeship. . . . **Bob Petkun** recently married Mary Zlison Leatart of North Hollywood, Calif., and is now employed in the Southern California aerospace industry while he awaits his 26th year. . . . **Dan Mintz** has joined the switch over to '68.

Finally, three Gold-x's have switched over: **George Goldmark** is entering his second year of medical school at Cornell Medical College along with his brother **Harry**. He feels he is doing his part to close the gap between medicine and engineering. . . . **Neil Goldstein** is teaching in New York in lieu of other types of jobs which are "all too available these days." His wife Carol ('70) is working as an all-around assistant in an architectural office. . . . **Eric Goldner** is teaching English and coaching dramatics in a junior high school on Long Island. He is still civilian and single and presently sees "no signs of change in either status."

Nuptial Notes

We have news about one coed this month. **Diane Mechler** is now Mrs. Diane Hills and is living in Winchester, Mass. More information when it is received.

Steve Silverstein married Susan Blonde, Wheelock '68, on June 28, 1969. Steve received a master's in E.E. from Carnegie-Mellon in May 1970 and also

has received a private pilot's license and instrument rating. . . . **Tom Murphy** got his M.S. in June 1970 and his Mrs. on August 9, 1969—the former Jane DaCosta who is now a senior at Sacred Heart University in Bridgeport, Conn. Tom is working at nearby Sikorsky Aircraft as a metallurgist, mainly in failure analysis. . . . **Walt Oney** wed the former Marty Buxton on April 25, 1970. Marty is a student nurse at New England Baptist Hospital and Walt is a system programmer at M.I.T.'s IPC. . . . **Scott Mermel** exchanged vows with Eve Bochner, sister of Barry Bochner, '70, in July. He is now working for Arthur Young & Co. in Boston, having received an S.M. in Course XV in June. . . . Getting closer to the present, **Paul Bente** married Henriette Bryan Alphin of Montgomery, Ala., in August. They are both graduate students at Cornell. . . . Finally we have no date for the marriage of **Lee Bowers** to the former Jane C. Pistone, Simmons '68. Lee worked for Monsanto in Springfield, Mass., for a year and is now moving to California.

Military Miscellanea

(The size of this section is only a reflection of current events and should not be interpreted as a bias of the authors.) On July 20, **Richard Scott** reported to the 2045th Communications Group at Andrews AFB, Washington, D.C. as an airman first class. . . . **Rick Badzik** was drafted in January 1969 and left for Vietnam in January 1970 where he is stationed with the 97th Military Police Battalion at Cam Rahn Bay working in intelligence. . . . **Bob Terry**'s wife writes that he is stationed with the signal corps in Thailand on a remote mountain called Phu Mu which translates as "Pig Mountain." "He says the country is interesting and currently water buffalo, rice paddies, and monsoon weather provide spice for daily life." . . . **Eric Sweetman** has been in Vietnam with the signal corps and should be leaving about now. . . . **George Brooks** is stationed at nearby Ft. Devens and is "fighting the military from within."

Anthony Trojanowski was commissioned a second lieutenant in military intelligence in February 1970 and at last report was taking a 32-week course in Vietnamese at Fort Bliss, Texas. . . . Lieutenant **Art Cole** is at McGuire AFB, N.J., running the passenger terminal when the brass lets him. His wife "Stanley" (Joanne '70) expects to finish her degree before they are sent to Germany this winter. . . . Ensign **Rich Lufkin** has left for the U.S.S. *Independence*, CVA-62, in the Mediterranean, hoping that an "Electronics Material Officer" billet has something to do with Electrical Engineering and Business (he received an M.B.A. from the University of Pennsylvania.) He finds himself turning from the conservative to the liberal camp as he contacts ultraconservative naval officers and tries to defend the meaning and means of change in our society. Rich wonders why people with master's degrees have to start at the bottom rung in the service and why his sister is making \$2.2k/year more teaching 5th grade. I hope he tells

us if he ever gets the answer. . . . Lieutenant (j.g.) **Tom James**, his wife Jane, and daughter Tiffany are alive and well in Norfolk where he is programming in support of the fleet. He recommends Virginia Beach for "rays & surf & chicks" and is captain of a local golf team. . . . **Leonard Mausner** has finished four months in the army reserve and is returning to Princeton to study nuclear chemistry.

Graduate School Stories

Sue Downs recently visited Leningrad and Moscow on a tour to meet and talk with Soviet urban and transportation planners. In August she left the Department of Transportation in Washington to return to Stanford's Department of Engineering Economic Systems to finish her degree. . . . Princeton gave master's degrees to the following members of the Class in the spring: **John Wyatt** in electrical engineering, **Emil Friedman** in chemistry, and **Paul Debevec** in physics.

Richard Borken reports passing his generals and is now working for a Ph.D. in Course VIII. . . . **Steve Gallant** is beginning a dissertation in operations research at Stanford. He refused induction last summer and suggests that "anyone with any doubts of the existence of the Military-Industrial-University Complex read the class notes for sickening proof."

Bogdan Marcovici is studying electrical engineering at U.C.L.A. and is pursuing experimental studies in smog, an abundant "resource" in the L. A. area.

Alexa Sorant received a master's in statistics from Harvard in June and she and **Pete** are moving to Durham, N.C., where it's Pete's turn to go to graduate school at U.N.C. So the M.I.T. Planning Office will be losing its ace planner. . . . **Paul Modrich** is still at Stanford working on a Ph.D. in biochemistry. . . . **Richard Mazer** is also at Stanford and is working on modeling a large communications system and on information retrieval programs for a number of government agencies. He is in a Ph.D. program in industrial engineering and writes "I really dig California." . . . **Thomas Romer** spent the summer at Yale's Economics Department doing research. He has passed his written qualifying exams there and faces his orals this fall. . . . **Steve Deneroff** has received a master's in M.E. from the University of Minnesota and will be getting an M.B.A. in December 1971. . . . **Sunny Alexis** has received an S.M. in Course XX and is continuing for a Ph.D.

Don Fye received a master's in E.E. from Brown, and then spent the summer in Providence continuing as a graduate student.

Working in the World

Finally, we come to that wonderful class of people who support the rest of us: those who work for a living, although some are working only for selective reasons. Even though there must be a lot of people in this group, we don't hear much from them. So if you work, don't be

ashamed, tell us what you're up to. **Rick Karash** is working for Professor Little's consulting firm while **Karla** has recently joined the M.B.T.A. as a systems analyst. . . . **Rick Rudy** has entered the second year of General Electric's Manufacturing Management Program. He spent the past year in Lynn as a manufacturing engineering specialist in the Medium Steam Turbine Department, then as a quality control supervisor of receiving inspection in the Analytical Measurements Business Section and is now in Erie, Pa., as a foreman in a piecework shop which makes motors and generators for locomotives and transit cars.

Harald Wilhelmsen is working in the electromagnetics department of the Radiation and Information Sciences Laboratory of the Sperry Rand Research Center in Sudbury. . . . **Bob MacDonald** is specifying and designing high-up-time systems as an engineer at Honeywell EDP in Waltham. Bob reports buying a house in Hudson, Mass., which keeps him busy enough to stay out of trouble, although he may be taking some courses this fall. . . . **Lucy ('67)** and **Don Hodges** have finished serving in the Peace Corps in Tunisia and are living in Atlanta.

Russell Silverman is working for Macro Services Corp. in Boston where he is the division manager for the Computer Utilities Division. . . . **John Niles** has received an M.S. in industrial administration from Carnegie-Mellon and is staying on there as a researcher in a project to investigate the effectiveness of private sector programs to reduce hard-core unemployment. . . . Finally, some people just can't leave this place. **Walt Nissen** is still working for M.I.T.'s Project TIP where he is converting programs to run on the MULTICS system.

You might remember a letter I wrote to the editor of *Technology Review* which was published on p. 93 of the May 1970 issue commenting on the annual alumni election. I have now been appointed to a committee of the Alumni Association to review the Constitution and By-Laws of the Association and recommend possible changes. You'll hear more about this elsewhere. While we're talking about the Association, **Jerry Grochow** has been appointed a member of the Alumni Fund Board, becoming the youngest member of that group in recent memory. '68 is being heard! See you next month and feel free to drop us a line.—**Gail and Mike Marcus**, Eastgate Apt. 16A, 60 Wadsworth St., Cambridge, Mass. 02142

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After another hot and sticky but interesting summer in New York City, I'm back in Cambridge for my second year at Harvard Law School. Please note my change of address at the end of this column. I've received several letters and notes from classmates regarding their summer activities. Drop me a line and let me know what you were up to this past year.

I have a number of weddings to report. **David P. Kelleher** married the former Miss Joanne Keene of Bardstown, Ky., on August 2, 1969. Dave is working for I.B.M. at the Boston Programming Center in Tech Square while Joanne is a graduate student in biology at Boston University.

Russell E. Molari married the former Miss Sylvia Nachlinger in Los Alamos in September 1969 and reports that he is currently "attempting to survive."

Steven H. Rothman was married on August 30, 1969, to the former Miss Milliecent Foret who graduated from Simmons College with a degree in nursing. Steve reports that he is still working for Digital Equipment Corp. in Maynard, Mass.

Kenneth Zwick was married on June 21, 1969, to the former Miss Ruth Epstein. Ken is currently employed by the Raytheon Company in their equipment division. . . . **James Sicilian** married the former Miss Natalie Dyer, a 1969 graduate of Katherine Gibbs. Jim is working towards a Ph.D. in nuclear engineering under an A.E.C. Fellowship at Stanford University. . . . **Robert Sable** was married to the former Miss Valerie P. Kubie on July 1, 1969. Bob is attending the Albert Einstein College of Medicine where he reports **Richard Kremsdorf** and **David Breindel** are classmates. . . . **Christopher R. Ryan** married the former Miss Janis Hernberg on June 8, 1969. Chris and Janis are living in Watertown, Mass., while Chris completes his studies towards an S.M. in the Department of Chemical Engineering at M.I.T. . . . **Thomas A. Schonhoff** married the former Miss Maria J. Peracchi in Boston on December 27, 1969. . . . I would like to extend congratulations to all the new husband and wife teams and welcome the wives to our class column.

Two other notes regarding marriages . . . **Steve Zayac** and **Marilyn Tamm** are planning to get married this winter if Steve doesn't get drafted first. Steve is studying towards his Ph.D. in material science at Michigan State University while Marilyn is working nearby for Owens Illinois. She plans to take courses towards her masters degree part-time starting this fall. Steve reports that both he and Marilyn are happy but "miss the Institute, the mountains, the ocean, and all of our friends." . . . **Bruce Donath** is proud to announce that his wife Peggy "delivered a beautiful baby girl Kate Elizabeth last December." Bruce adds that he has managed to find a house in Mahopac, N.Y., and that "debt financing has become a way of life."

Among other notes I have the following: **Donald L. Forman** is a linguistics major at the University of California at San Diego. . . . **Ivan R. Burns** will be in the first-year class at Harvard Business School this fall after another summer working for the R.C.A. Space Center in Princeton, N.J. . . . **Elizabeth H. Recks** has completed her first year as a Chancellor's Teaching Fellow at U.C.L.A. and is making progress in a Ph.D. program.

Michael S. Devorkin will be entering his second year of Yale Law School this fall. Mike helped run the Yale Law School lobby in Washington, D.C., this past spring and spent this summer working for Ralph Nader while trying to work on a note for the *Yale Law Journal* and take his exams . . . **William Harris** left the U.S. in August to act as a ship repair advisor in the Vietnamization Program in Saigon.

Robert A. Gentala is a graduate student in physics at the University of Arizona. . . . **Lawrence A. Stelmack** is reentering M.I.T. this fall to work for an S.M. in a interdisciplinary urban systems/management program. . . . **Stanley J. Sramek** is doing graduate work in physics at Berkeley. Stan was reclassified 1-A on June 27, 1969, and passed his physical in August of 1969. He might still escape the draft since his lottery number is 294. . . . **David L. Felten** did research in neuroanatomy this summer after completing his first year of medical school in an M.D.-Ph.D. program at the University of Pennsylvania . . . **F. J. Emmenegger** is working on project "Skylab" (orbital workshop) with McDonnell-Douglas Astronautics Co. He received his master's degree in aerospace engineering from the University of Michigan. . . . **Hal R. Varian** has completed his first year as a graduate student in economics at Berkeley. . . . **Robert A. Schaeffer** is employed by the Education Research Center at M.I.T. as an instructor in the Unified Science Studies Program. Bob is also serving on the faculty task force on educational innovation. . . . **William E. Holland** spent a year with Vincent G. Kling & Assoc., a Philadelphia architectural firm, designing office buildings before deciding to strike out on his own. Bill is now working out of Georgetown, Maine, designing bathrooms. . . . **Jeremy Raines** received his S.M. in applied physics from Harvard University on June 11. "Overcome by an irresistible homesickness for the 'Tute," Jeremy is returning to M.I.T. this fall to take a crack at a Ph.D. in electrical engineering. He reports that upon graduation this June, he went to work as a Kelly girl. (?) After a week of typing envelopes, he resumed his usual summer electronic activities at NAVELEX in Washington, D.C. . . . **Gregory Kast** has a brother Michael in the entering class of 1974. . . . **Bruce K. Hamilton** was on a task force addressing itself to the specific question of "if and how M.I.T. should undertake a coordinated, large-scale program in environmental quality research." . . . **Roger Chang** was promoted to first lieutenant while assigned to graduate civil schooling by the army. Roger is putting his wife Lula through school at the University of Michigan while also supporting a German Shepherd, a cat, and two birds. In his "spare time," Roger is working on the control and operation of the 1872 megawatt Ludington Pumped Storage Power Plant Control Center as part of his graduate work. . . . Drop me a line when you get the chance.—**Richard J. Moen**, Secretary-Treasurer, 412 Hastings, Cambridge, Mass. 02138

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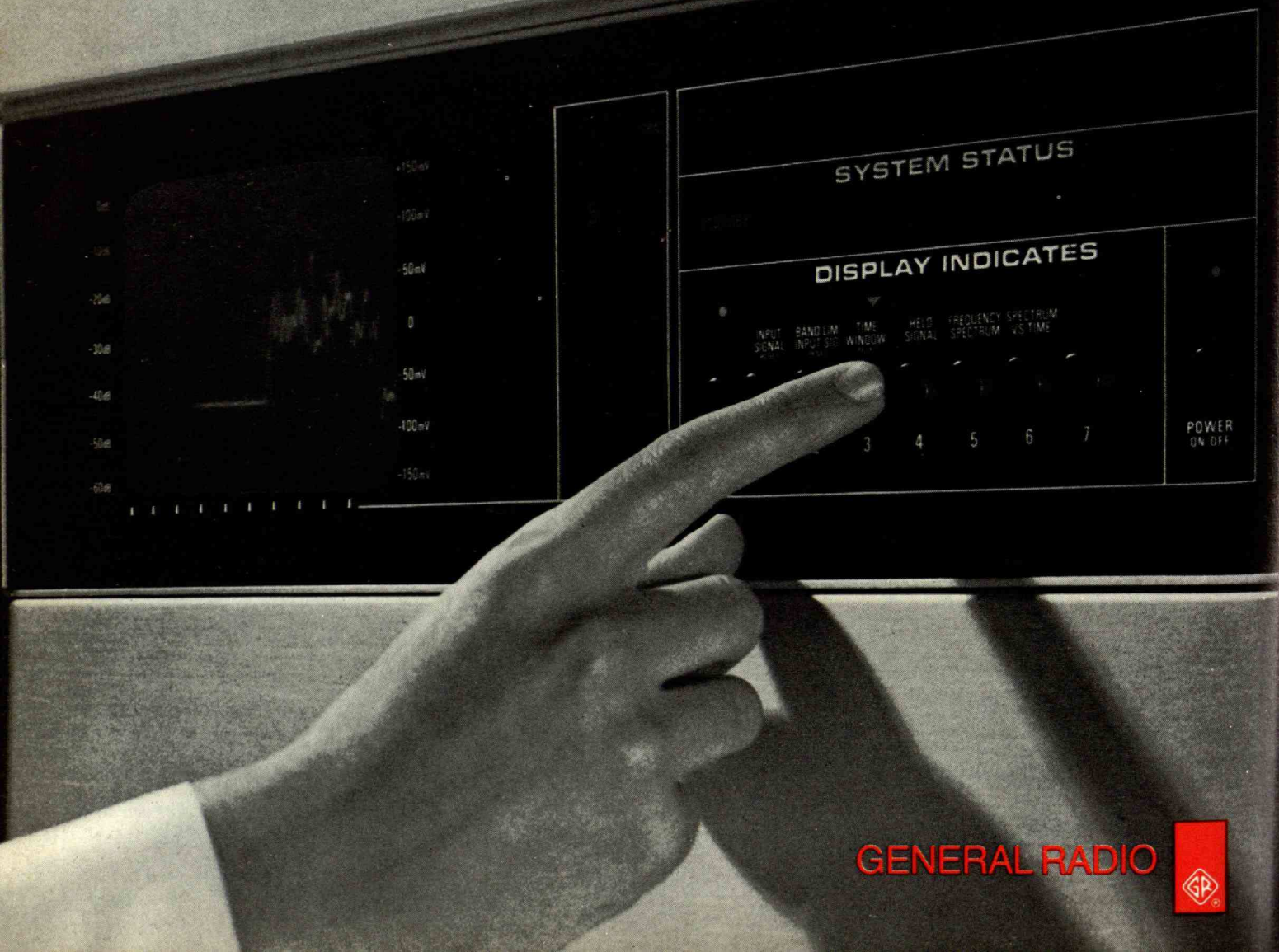
Accuracy: ± 1 dB in level; $\pm 1\%$ in frequency. **Dynamic Range:** 54 dB.

Presentation: Built-in storage scope displays input signal, measurement trigger point, analysis "window," recorded signal, frequency spectrum, rms-ensemble-averaged spectrum, frequency components versus time, and measurement parameters (instrument control settings). Hard-copy records also possible.

Price: \$32,000 in the U.S.A.

easy spectrum analysis

just push these seven buttons
and watch the scope



GENERAL RADIO

